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VOLUME 23/ NUMBER 5
MARCH 8, 1985
ACC. NOS. N85-13766 TO N85-14785

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AN ABSTRACT JOURNAL

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PUBLISHED BY:

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Scientific and Technical Aerospace Reports, Volume 23, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

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US ISSN 0036-8741

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Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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ASTRONAUTICS

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Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

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For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

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Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

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Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
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81 ADMINISTRATION AND MANAGEMENT **734**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 734
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 736
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION N.A.
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 736

89 ASTRONOMY 741
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 742
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 745
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 745
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 746
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

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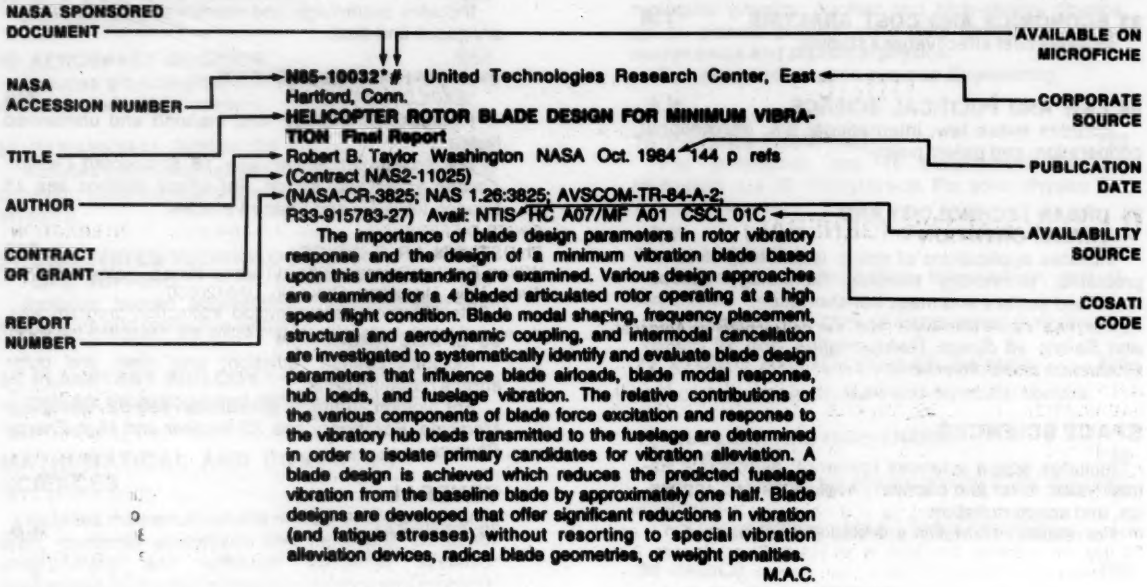
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N85-10032*# United Technologies Research Center, East Hartford, Conn.
CORPORATE SOURCE
TITLE
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
AUTHOR
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NAS2-11025)
REPORT NUMBER
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
AVAILABILITY SOURCE
COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 5 / MARCH 8, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-13766# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction de l'Aerodynamique.
MANUFACTURING REPORT OF AN AUGMENTED LIFT, VARIABLE DEFLECTION HALF WING [RAPPORT DE FIN DE FABRICATION DE LA DEMI-AILE HYPERSUSTENTEE A FLECHE VARIABLE]
J. J. Thibert Aug. 1984 15 p refs In FRENCH
(Contract STPA-83-95-017)
(ONERA-RT-25/1736-AY-108-A) Avail: NTIS HC A02/MF A01

The manufacturing controls and characteristics of an augmented lift wing model with a deflection variable between 0 and 50 deg are reported. The wing is an RA16SCI profile with 2 m wing span. The augmented lift system is implemented with two wing tips and a flap with variable deflection. The controls show that the specified tolerances are respected. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-13767 Tennessee Univ., Knoxville.
A STUDY OF LIFT CHARACTERISTICS OF AN UPPER SURFACE BLOWN JETWING WITH A RECTANGULAR NOZZLE Ph.D. Thesis
Atin Kumar Sinha 1984 144 p
Avail: Univ. Microfilms Order No. DA8421406

The lift characteristics of an upper surface blown (USB) jet-flapped aircraft with rectangular nozzle were studied. An empirical criterion was used to replace the jet sheet leaving the trailing edge with an equivalent mechanical flap extension. Lifting line analysis was used to obtain the spanwise load and induced angle of attack distribution. Additional supercirculation, because of the presence of a high energy jet on the wing upper surface, was obtained from momentum considerations. The predicted values of lift and pitching moment coefficient (C(L) and C(M)) were compared with full scale wind tunnel and flight test data on the Ball-Bartoe JETWING USB aircraft and show good agreement in C(L). The semi-empirical model developed can handle a part scale flap with variable jet momentum distribution and chordwise location of the nozzle. This simple method is considered to be a valuable tool for the preliminary design of an USB aircraft with a rectangular nozzle. Dissert. Abstr.

N85-13768 Stanford Univ., Calif.
SIMULATION OF SEPARATED TRANSONIC AIRFOIL FLOW BY FINITE-DIFFERENCE VISCOUS-INVISCID INTERACTION Ph.D. Thesis
William Ray VanDalsem 1984 118 p
Avail: Univ. Microfilms Order No. DA8420630

A finite-difference viscous-inviscid interaction program was developed which is capable of simulating the separated transonic flow about non-lifting and lifting airfoils. This code consists of direct-inverse, finite-difference boundary layer algorithm coupled with a transonic full-potential airfoil program using viscous-inviscid interaction algorithms. The accuracy and efficiency of the developed viscous and viscous-inviscid interaction programs was tested and verified by comparison with theory, the results of other boundary-layer and Navier-Stokes computations, and experimental data. Separated transonic flow fields about lifting airfoils are accurately simulated for approximately 1 to 5% of the cost of a Navier-Stokes simulation of equal resolution. Because efficient viscous and inviscid algorithms are used and the viscous-inviscid interaction convergences rapidly, it is expected the code will also compare favorably with other codes of its type as they become available. Dissert. Abstr.

N85-13769 Stanford Univ., Calif.
TRANSITION AND MIXING IN AXISYMMETRIC JETS AND VORTEX RINGS
Gary Arthur Allen, Jr. 1984 336 p
Avail: Univ. Microfilms Order No. DA8420481

A class of impulsively started, axisymmetric, laminar jets produced by a time dependent point source of momentum is considered. The jets studied are different flows, each initially at rest in an unbounded fluid. The time dependence of the point source of momentum categorizes the specific type of jet under investigation. The study of these flows is conducted at three levels of detail. (1) a generalized set of analytic creeping flow solutions is derived, along with a method of flow classification; (2) from this generalized set there are three specific creeping flow solutions which are studied in detail; the vortex ring, the round jet, and the ramp jet; (3) the third level of study examines the axisymmetric round jet which was solved numerically using the unsteady laminar Navier Stokes equations. Dissert. Abstr.

N85-13770 Stanford Univ., Calif.
THE NUMERICAL SIMULATION OF STEADY TRANSONIC ROTATIONAL FLOW USING A DUAL POTENTIAL FORMULATION Ph.D. Thesis
Neal Michael Chaderjian 1984 169 p
Avail: Univ. Microfilms Order No. DA8420503

Two finite difference methods were developed to numerically simulate steady transonic rotational flow of an inviscid fluid by representing the velocity field as the sum of scalar and vector potentials. The resulting dual potential equations are efficiently solved as iteratively decoupled scalar equations. Moreover, an alternate treatment of lifting airfoil flow is presented that avoids the use of circulation wake cuts by specifying the vector potential as a constant on the airfoil surface. The zonal method has been verified on a nonlifting biconvex airfoil while the entropy correction method has been verified on both nonlifting and lifting airfoils.

The entropy correction method is more efficient than the zonal method, and an optimized/vectorized entropy correction code should be able to obtain rotational solutions in about three seconds of Cray-XMP time. Dissert. Abstr.

N85-13771 California Inst. of Tech., Pasadena.
LARGE STRUCTURE IN THE FAR WAKES OF TWO-DIMENSIONAL BLUFF BODIES Ph.D. Thesis
John Michael Cimbala 1984 139 p
Avail: Univ. Microfilms Order No. DA8420802

Smoke wire flow visualization and hot wire anemometry were used to study near and far wakes of two dimensional bluff bodies. For the case of a circular cylinder at $70 < Re < 2000$, a very rapid (exponential) decay of velocity fluctuations at the Karman vortex street frequency is observed. Beyond this region of decay, larger scale (lower wave number) structure can be seen. In the far wake (beyond one hundred diameters) a broad band of frequencies is selectively amplified and then damped, the center of the band shifting to lower frequencies as downstream distance is increased. The far wake structure does not depend directly on the scale or frequency of the original Karman vortices, the growth of this structure is due to hydrodynamic instability of the developing mean wake profile. It is not caused by amalgamation of the Karman vortices. Similar large structure is observed downstream of porous flat plates ($Re = 6000$), which do not initially shed Karman type vortices into the wake. Hot wire measurements show that two dimensional locally parallel inviscid linear stability is adequate to explain the growth of downstream structure. Dissert. Abstr.

N85-13772 California Inst. of Tech., Pasadena.
EVALUATION OF THE UNSTEADY EFFECTS FOR A CLASS OF WIND TURBINES Ph.D. Thesis
Jean-Luc Cornet 1984 148 p
Avail: Univ. Microfilms Order No. DA8420803

A class of vertical axis wind turbines is investigated with the unsteady effects due to the rotating blade motion fully taken into account. In part one, a hydromechanical theory is developed which proceeds from the point of view of unsteady airfoil theory. A rotor comprised of a single blade is used and a two dimensional analysis is applied to a cross section of the rotor in the limiting mode of operation. Use of linearized theory and of the acceleration potential allows the problem to be expressed in terms of a Riemann-Hilbert boundary value problem. Explicit expressions of the instantaneous forces and moments acting on the blade are given and the total energy lost by the fluid and the total power input to the turbine are determined. In part two, the lift acting on a wing crossing a vortex sheet is evaluated by application of a reciprocity theorem in reverse flow. This theorem follows from Green's integral theorem and relates the circulation around a blade having impulsively crossed a vortex wake to the lift acting on a blade continuously crossing a vortex wake. Dissert. Abstr.

N85-13773 Ohio State Univ., Columbus.
EXPERIMENTAL STUDIES OF TRANSONIC AIRFOIL TRAILING EDGE AND WAKE FLOWFIELD PROPERTIES Ph.D. Thesis
Deems Shelton Emmer 1984 226 p
Avail: Univ. Microfilms Order No. DA8418937

An experimental investigation of several of the trailing edge and wake turbulence properties for a NACA 84A010 airfoil section was completed. The experiment was conducted at The Ohio State University Aeronautical and Astronautical Research Laboratory in the 6 inch x 22 inch transonic flow facility. For both angles of attack, the turbulence intensities and turbulence kinetic energy were observed to decay in the streamwise direction. In the fair wake, the turbulence intensities were nearly isotropic for the nonlifting case. For the two degree case, the horizontal component of the turbulence intensity was observed to be substantially higher than the vertical component. For each survey, the data demonstrated excellent repeatability with a high degree of spatial resolution. The results of this research should provide guidance for the development, verification, and improvement of turbulence modeling. Dissert. Abstr.

N85-13774 California Univ., Los Angeles.
TRANSONIC JETS: A NUMERICAL APPROACH IN THE HODOGRAPH PLANE Ph.D. Thesis
Scott Everett Rimbey 1984 73 p
Avail: Univ. Microfilms Order No. DA8420230

The transonic flow of gas through a nozzle is studied. Both two-dimensonal and axisymmetric nozzles are considered, as are both small-disturbance and exact theory. In small-disturbance theory the angle of the nozzle wall to the horizontal must be small. Of particular interest are the shape of the sonic line and the conditions at which the maximum mass flux (choking) occurs. Boundary value problems for the stream function are established in the hodograph (velocity) plane. Type sensitive finite difference versions of the partial differential equations are solved numerically by the method of line relaxation. Coordinates in the physical plane are obtained by integration. Dissert. Abstr.

N85-13775*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE SHUTTLE ORBITER TRIMMED CENTER-OF-GRAVITY EXTENSION STUDY. VOLUME 8: EFFECTS OF CONFIGURATION MODIFICATIONS ON THE AERODYNAMIC CHARACTERISTICS OF THE 140 A/B ORBITER AT A MACH NUMBER OF 5.97
W. Pelham Phillips Nov. 1984 71 p refs
(NASA-TM-72661-Vol-8; NAS 1.15:72661-Vol-8) Avail: NTIS HC A04/MF A01 CSCL 01A

Aerodynamic characteristics are presented at $M=5.97$ for the 140 A/B Space Shuttle Orbiter configuration (0.010 scale) and for the configuration modified by geometric changes in the wing planform fillet region and the fuselage forebody. The modifications, designed to extend the orbiter's longitudinal trim capability too more forward center of gravity locations, included reshaping the baseline wing fillet, changing the fuselage forebody camber, and adding canards. The investigation was made in the Langley 20-Inch Mach 6 Tunnel at a Reynolds number of approximately 6 million based on fuselage reference length. The angle of attack range of the investigation varied from about 15 deg to 35 deg at 0 deg and -5 deg sideslip angles. Data were obtained with the elevators and body flap deflected at appropriate negative and positive conditions to assess the trim limits. Author

N85-13776*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
COMPUTER PROGRAMS TO PREDICT INDUCED EFFECTS OF JETS EXHAUSTING INTO A CROSSFLOW
S. C. Perkins, Jr. and M. R. Mendenhall Jun. 1984 157 p refs
(NASA-CR-166591; NAS 1.26:166591; NEAR-TR-328) Avail: NTIS HC A08/MF A01 CSCL 01A

A user's manual for two computer programs was developed to predict the induced effects of jets exhausting into a crossflow. Program JETPLT predicts pressures induced on an infinite flat plate by a jet exhausting at angles to the plate and Program JETBOD, in conjunction with a panel code, predicts pressures induced on a body of revolution by a jet exhausting normal to the surface. Both codes use a potential model of the jet and adjacent surface with empirical corrections for the viscous or nonpotential effects. This program manual contains a description of the use of both programs, instructions for preparation of input, descriptions of the output, limitations of the codes, and sample cases. In addition, procedures to extend both codes to include additional empirical correlations are described. Author

N85-13777*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL INVESTIGATION OF THE PARALLEL BLADE-VORTEX INTERACTION
F. X. Caradonna, G. H. Laub, and C. Tung Nov. 1984 33 p refs
(NASA-TM-86005; A-9850; NAS 1.15:86005; USAAVSCOM-TM-84-A-9) Avail: NTIS HC A03/MF A01 CSCL 01A

A scheme for investigating the parallel blade vortex interaction (BVI) has been designed and tested. The scheme involves setting

a vortex generator upstream of a nonlifting rotor so that the vortex interacts with the blade at the forward azimuth. The method has revealed two propagation mechanisms: a type C shock propagation from the leading edge induced by the vortex at high tip speeds, and a rapid but continuous pressure pulse associated with the proximity of the vortex to the leading edge. The latter is thought to be the more important source. The effects of Mach number and vortex proximity are discussed. Author

N85-13778# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
FLOW AROUND BLUFF BODIES: NUMERICAL AND EXPERIMENTAL APPROACHES
1984 309 p refs Lecture Series held at Rhode-Saint-Genese, Belgium, 21-25 May 1984
(VKI-LS-1984-06) Avail: NTIS HC A14/MF A01

Flow around bluff obstacles; the aerodynamics of bluff bodies in turbulent shear layers; experimental techniques and instrumentation for bluff body aerodynamics; numerical methods for bluff body aerodynamics; wake flow behind bluff bodies; numerical integrations of the Navier-Stokes equations for flow over surface mounted obstacles; and the generation of trailing vortices by surface mounted obstacles were discussed. For individual titles, see N85-13779 through N85-13786.

N85-13779# Cambridge Univ. (England).
FLOW AROUND BLUFF BODIES
J. C. R. Hunt *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 57 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Airflow around single bluff obstacles and groups of obstacles is discussed in terms of object effects on the flow and kinematical analysis. Physical flow mechanisms and their approximate magnitudes are considered, using appropriate idealizations. Turbulence, boundary layers and separated flows, vortices, and wakes are covered. Flow analysis by examining surface shear stress lines and mean streamline patterns is introduced.
Author (ESA)

N85-13780# Surrey Univ., Guildford (England).
THE AERODYNAMICS OF BLUFF BODIES IN TURBULENT SHEAR LAYERS
A. Hunt *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 35 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Initial conditions of a deep turbulent boundary layer flowing in equilibrium over a rough wall, approaching a bluff body, are summarized. Geometry effects on flow structures, pressure field and diffusion characteristics are discussed. The incident shear layer features, including scaling model tests are considered.
Author (ESA)

N85-13781# Surrey Univ., Guildford (England).
EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION FOR BLUFF BODY AERODYNAMICS c35
A. Hunt *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 32 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Flow visualization around bluff bodies, velocity measurement, pressure measurement, and scalar concentration measurement are discussed. Hot-wire and laser anemometry techniques are described. Modeling of wind pressures for building design is introduced. Author (ESA)

N85-13782# Flow Science, Inc., Los Alamos, N. Mex.
NUMERICAL METHODS FOR BLUFF BODY AERODYNAMICS
C. W. Hirt *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 67 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

A three dimensional finite difference method for generating, interpreting, and presenting data on aerodynamic processes associated with bluff bodies is outlined. Use of the code is illustrated with calculations of three dimensional flows about simple bluff bodies. These examples reveal a number of limitations, and examples of how limitations can be removed by advanced modeling techniques are given. The interpretation, graphic presentation, and validation of numerically generated data are considered.
Author (ESA)

N85-13783# Surrey Univ., Guildford (England).
WAKE FLOW BEHIND BLUFF BODIES
I. P. Castro *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 66 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Steady separated flow behind bluff obstacles is discussed. Far wakes, whether free or wall bounded interior boundary layers, appear to depend strongly on the nature of the highly turbulent recirculation flow immediately behind the obstacle. Near wakes can be analyzed using deductions from flow visualization and surface measurements and by pulsed wire anemometry within the flow. Vortex shedding in fluctuating flow is considered.
Author (ESA)

N85-13784# Royal Aircraft Establishment, Bedford (England). Meteorological Research Unit.
NUMERICAL INTEGRATIONS OF THE NAVIER-STOKES EQUATIONS FOR FLOW OVER SURFACE-MOUNTED OBSTACLES
P. J. Mason *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 18 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Resolution requirements of finite difference models of laminar and turbulent flows, which limit the Reynolds number for which a solution can be obtained, are discussed. Results for a method which uses the Taylor series approach to provide a match of the viscous terms to the arbitrary surface are shown. The nonlinear terms are allowed to see a stepped surface following the grid point locations. In laminar flows, provided the resolution is adequate, the errors in the nonlinear terms are effective, owing to their relative magnitude, second order effects. The method can consider Reynolds numbers up to 400. Author (ESA)

N85-13785# Royal Aircraft Establishment, Bedford (England). Meteorological Research Unit.
ON THE GENERATION OF TRAILING VORTICES BY SURFACE MOUNTED OBSTACLES
P. J. Mason *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 14 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Trailing horseshoe vortices behind objects with cross stream symmetry, and single vortices behind obstacles skew to the stream are discussed. Single vortices are explained as corresponding to one-half of a trailing wing tip vortex system. The body is envisaged to act as one half of a lifting body extending from a mirror plane. Although the mechanism of vortex generation is analogous to that occurring with lifting body, a rigid no slip plane does not act as a mirror plane, and gives important differences. Horseshoe vortices are generated as basic boundary layer vorticity piles up ahead of the obstacle and is stretched away downstream in two arms forming a trailing pair. Such trailing vortices have a sense giving downwash on the plane of symmetry, but upwash and flows containing both senses of a vortex pair also occur. Author (ESA)

N85-13786# Leicester Univ. (England).
ACCELERATION OF BLUFF BODIES THROUGH FLUIDS c34
D. J. Cockrell *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 22 p (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

Problems arising from the unsteady motion of bluff bodies immersed in fluids which are of density comparable with the bodies are discussed. Gust loads on trucks, offshore platforms, parachute canopies and ships in maneuver are considered. It is not difficult to obtain estimates of loads developed with sufficient accuracy, either by using theoretical or experimental estimates of the necessary added mass coefficients. However, in order to determine frequencies or damping rates of ensuing oscillations it is not sufficiently precise to use quasi-steady flow assumptions based on potential flow analysis. Experimental data are not sufficiently well ordered in terms of the dependent parameters required to define flow conditions. In order to model the physics of bluff body flow adequately it may be necessary to introduce memory effects into the equations of motion. Author (ESA)

N85-13787# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Versuchs- und Forschungsanlage.
FLOW CÁLCULATION ON A THIN WING, WITH SPECIFIC ATTENTION TO SEPARATION POINT AT THE TRAILING EDGE [STROEMUNGSBEREICH UM SCHLANKE FLUEGEL UNTER BERUECKSICHTIGUNG DER STROEMUNGSABLOESUNG AN DER SEITENKANTE]
Marcel Schleicher 16 Apr. 1984 33 p refs In GERMAN (FTW-FO-1721) Avail: NTIS HC A03/MF A01

A three dimensional computation method for subsonic flows was expanded to cope with nonlinear effects inducing separation point on the trailing edge. The calculation was made on rectangular and triangular plates and shows the lift distribution over the wing span and the trailing vortex generated. The method provides good results concerning rectangular and trapezoidal wings while for delta wings numerical difficulties occur. Nevertheless in that case, results are as precise as far more expensive methods. It describes corectly the external flow, and a flap angle can be introduced in the data. Author (ESA)

N85-14655# Joint Publications Research Service, Arlington, Va.
FRICTION AND HEAT EXCHANGE IN LAMINAR AND TURBULENT BOUNDARY LAYERS WITH AXISYMMETRICAL BODIES EXPOSED TO HETEROGENEOUS SUPERSONIC FLOW Abstract Only
I. G. Yeremeytsev and N. N. Pilyugin *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 18 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 2, Mar. - Apr. 1984 p 65-72 Original language document announced as A84-35734 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

N85-14656# Joint Publications Research Service, Arlington, Va.
PROPULSIVE EFFICIENCY OF VIBRATING WING IN SUPERSONIC FLOW Abstract Only
M. N. Kogan and M. V. Ustinov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 19 Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), no. 2, Mar. - Apr. 1984 p 132-139 Original language document announced as A84-35736 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

N85-14659# Joint Publications Research Service, Arlington, Va.
NUMERICAL METHOD FOR COMPUTING SUPERSONIC FLOW OVER WINGS OF FLIGHT VEHICLES Abstract Only
G. P. Voskresenskiy *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 25 Transl. into ENGLISH from Zh. Vychisl. Mat. i Mat. Fiz. (Moscow), v. 24, no. 6, Jun. 1984 p 900-915 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-13788# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT, SCANDINAVIAN AIRLINES SYSTEM, FLIGHT 901, McDONNELL DOUGLAS DC-10-30, JOHN F. KENNEDY INTERNATIONAL AIRPORT, JAMAICA, NEW YORK, FEBRUARY 28, 1984
15 Nov. 1984 86 p
(PB84-910415; NTSB/AAR-84/15) Avail: NTIS HC A05/MF A01

The landing and crash of Scandinavian Airlines System's Flight 901 are discussed. On February 28, 1984, Scandinavian Airlines System Flight 901, a McDonnell Douglas DC-10-30, was regularly scheduled international passenger flight from Stockholm, Sweden, to New York City, New York, with an en route stop at Oslo, Norway, Following an approach to runway 4 right at New York's John F. Kennedy International Airport, the airplane touched down about 4,700 ft (1,440 meters) beyond the threshold of the 8,400 foot (2,560 meter) rnway and could not be stopped on the runway. The airplane was steered to the right to avoid the approach light pier at the departure end of the runway and came to rest in Thurston Basin, a tidal waterway located about 600 ft from the departure end of runway 4R. The 163 passengers and 14 crewmembers evacuated the airplane safely, but a few received minor injuries. The nose and lower forward fuselage sections, wing engines, flaps, and leading edge devices were substantially damaged at impact. The weather was ceiling 200 ft overcast, 3/4 mile visibility, with light drizzle and fog. The temperature was 47 F with the wind from 100 at 5 knots. The surface of the runway was wet, but there was no standing water. R.J.F.

N85-13789*# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT, WESTERN HELICOPTERS, INC., BELL UH-1B, N87701, VALENCIA, CALIFORNIA, JULY 23, 1982
30 Oct. 1984 39 p Supersedes NTSB/AAR-84/02
(PB84-910414; NTSB/AAR-84/14; NTSB/AAR-84/02) Avail: NTIS HC A03/MF A01

The helicopter was being used in conjunction with the filming of a motion picture scene depicting a village typical of vilages in Viet Nam which was under attack from heavy ordnance. The helicopter was used as a camera platform as well as playing an active role in the movie sequence. The helicopter was hovered about 25 feet above the village and nearly directly above the location where special effects explosives were detonated to simulate the heavy ordnance. As the pilot turned his helicopter to the left to provide camera coverage, the helicopter's tail section was engulfed in a fireball created by the detonation of a special effect explosion. The tail rotor assembly separated the helicopter descended out of control. The helicopter's main rotor blade struck and fatally injured three actors on the ground. The six occupants on the helicopter sustained minor injuries, and the aircraft was damaged substantially. Author

N85-13790# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT AIR CANADA, LOCKHEED L-1011, C-FTNJ, NEAR CHARLESTON, SOUTH CAROLINA, NOVEMBER 24, 1983
16 Oct. 1984 36 p
(PB84-910413; NTSB/AAR-84/13) Avail: NTIS HC A03/MF A01

At 1916:02, Air Canada flight 965 was cleared to climb and maintain flight level (FL) 370 from FL 350. About 2 minutes later, the ground controller asked the flight to start a turn to the north

because of other traffic. The captain stated that he may have to detour around some thunderstorms and also replied that he was in the turn. About 8 minutes later, the flight encountered severe turbulence which lasted several seconds. One flight attendant and three passengers were seriously injured during the encounter, and two physicians aboard the flight provided immediate medical attention. The flight continued to its destination and landed without further incident about 1 1/2 hours after the accident. Medical assistance was available at the gate to provide treatment when the flight arrived. The National Transportation Safety Board determines that the probable cause of the accident was an encounter with severe clear air turbulence produced by the intrusion of thunderstorm cells into strong winds aloft. Author

N85-13791# Hoechst A.G., Frankfurt am Main (West Germany).
TO TAKE OFF AND TO LAND SAFELY, HOECHST 1678 FOR ICE AND SNOW FREE RUNWAYS [SICHER STARTEN-SICHER LANDEN HOECHST 1678 FUER EIS- UND SCHNEEFREIE LANDEBAHNEN]
May 1983 20 p In GERMAN Original contains color illustrations
Avail: NTIS HC A02/MF A01

A chemical deicer for runways, based on nontoxic glycols was developed. It is biodegradable, compatible with thermal deicing, and can be combined with granulated urea. Combined thermal and chemical deicing to reduce runway erosion is proposed. With the aid of clearing vehicles, the ice can be removed after 20 to 45 min. Author (ESA)

N85-13792# European Space Agency, Paris (France).
GERMAN DOMESTIC SCHEDULED AIR TRANSPORT IN THE YEAR 2000
Rolf Juergen Haupt May 1984 94 p refs Transl. into ENGLISH of "Innerdeut. Linienluftverkehr des Jahres 2000', DFVLR, Cologne Rept. DFVLR-FB-83-03, 1983
(ESA-TT-828; DFVLR-FB-83-03) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 28,60

Supply alternatives for domestic scheduled air transport in Germany, based on the year 2000, are presented and evaluated. The financial effects of changes in the available services on an air transport company and on airports (altered revenue from landing charges) are shown, based on a forecast of the air transport market from a cost/revenue calculation model for this market. Substitution effects involving high-speed rail transport are presented. Author (ESA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-13793# Mitre Corp., McLean, Va. Metrek Div.
TCAS 2 LOGIC PERFORMANCE DURING PHASE ONE OPERATIONAL EVALUATION Final Report
Lillian B. Zarrelli Washington FAA Oct. 1984 64 p refs
(Contract DTFA84-C-00001)
(DOT/FAA/PM-84/20; MTR-84W107) Avail: NTIS HC A04/MF A01

This document describes the performance of the collision avoidance logic during the Phase I Operational Evaluation of the Traffic Alert and Collision Avoidance System called Minimum TCAS II. Between November 1981 and March 1982, TCAS units were installed on two Piedmont Airlines B727 aircraft flown on regularly scheduled passenger flights. For this phase of testing, data was recorded while trained observers viewed the TCAS advisories. However, these displays were not shown to the flight crew. The analysis of logic performance first required identification and removal of alerts caused by hardware or software problems that were subsequently fixed, or else caused by problems in the collision avoidance logic which were subsequently removed. Examples are shown for which logic improvements correct earlier problems. Operational questions, observer comments, and an assessment of the true alert rate are then examined using the recorded data. Author

N85-13794# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Hochfrequenz-Verfahren.
TIME COMPARISON WITH GPS TECHNIQUE AND FIRST RESULTS WITH THE DFVLR C/A CODE RECEIVER
Hartmut Nau Nov. 1983 23 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-894)
(DFVLR-Mitt-84-05) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 9,50

A single channel C/A-code Global Positioning System receiver was developed and time comparison between an atomic clock and US Naval Observatory Masterclock was performed. This system enables satellite localization, time dissemination measurements and time comparison between any two locations. The comparison technique is described and results show a drift in time measurements < 20 nsec and a drift in frequency measurements of 0.0002/wk. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-13795# Centre d'Essais en Vol, Istres (France). Base d'Essais.
THE DG400 PROPULSED GLIDER [PLANEUR PROPULSE DG 400]
12 Sep. 1984 63 p refs In FRENCH
(CEV/IS/SE/AV/84) Avail: NTIS HC A04/MF A01

Test results of a Glaser-Dirks glider are presented. The aircraft has 15 m wingspan, weighs 300 Kg and has a 32 kW internal combustion motor. The flight tests included 19 flights and 27 hr total flight time. The generally positive results assure a recommendation for DG400 certification. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-13796 Cincinnati Univ., Ohio.
SURGE TRANSIENT SIMULATION IN TURBO-JET ENGINE

Ph.D. Thesis
Yokichi Sugiyama 1984 264 p
Avail: Univ. Microfilms Order No. DA8420917

Surge transient flow phenomena and unsteady compressor operating point excursion during surge in a turbojet engine, is analyzed using a dynamic simulation model. A one-dimensional model which is capable of simulating very large surge disturbance propagations in the direction of the engine axis from the air intake to the exhaust nozzle was developed. Disturbances to which the engine response leading to surge is simulated, are unsteady planar inlet total pressure and temperature disturbance, fuel pulse at the combustor and exit nozzle area throttlings. The unknown stalled characteristics of the compressor stages were predicted through a parametric study based on the agreement of the overall computed results, such as surge hammer over-pressures and reduced burner pressures, with the available experimental data. It was found that the stall method, i.e. the surge-causing disturbance, significantly affects the compressor operating point excursion and thus the surge flow transient phenomena. The mass flow rate through the compressor reduced to a very low (nearly zero or negative) value in roughly 10 milliseconds. Dissert. Abstr.

N85-13797 California Inst. of Tech., Pasadena.
PRESSURE OSCILLATIONS IN LIQUID-FUELED RAMJET ENGINES Ph.D. Thesis
Vigor Yang 1984 188 p
Avail: Univ. Microfilms Order No. DA8420843

Pressure oscillations in liquid fueled ramjet engines were studied. Linear unsteady motions in coaxial dump configurations were examined. The flowfield in the dump combustor is approximated by division into three parts: a flow of reactants, a region containing combustion products, and a recirculation zone, separated by two infinitesimally thin sheets, the flame and the vortex sheets. The oscillatory field in the inlet is coupled in the field in the combustor at the dump plane to determine the complex frequencies characterizing the linear stability of the engine. The nonlinear behavior of the shock wave in the inlet diffuse was investigated. The response of a shock wave to various disturbances, including finite and large amplitude oscillations was studied. The results serve as a basis for stability characteristics of the inlet flow analysis. The pressure oscillations in side dump ramjet engines were discussed. The flowfields were constructed in two regions: the inlet section, including a region of fuel injection, and a dump combustor. The oscillatory characteristics engine are determined by its response to a disturbance imposed on the mean flow. Dissert. Abstr.

N85-13798*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW INTEGRATION TECHNIQUES FOR CHEMICAL KINETIC RATE EQUATIONS. 2: ACCURACY COMPARISON
Krishnan Radhakrishnan (Michigan Univ., Ann Arbor) 1985 15 p refs Proposed for presentation at the 30th Intern. Gas Turbine Conf. and Exhibit, Houston, 17-21 Mar. 1985; sponsored by ASME
(NASA-TM-86893; E-2366; NAS 1.15:86893) Avail: NTIS HC A02/MF A01 CSCL 21E

A comparison of the accuracy of several techniques recently developed for solving stiff differential equations is presented. The techniques examined include two general purpose codes EEPISODE and LSODE developed for an arbitrary system of ordinary differential equations, and three specialized codes CHEMEQ, CREKID, and GCKP84 developed specifically to solve chemical kinetic rate equations. The accuracy comparisons are made by applying these solution procedures to two practical combustion kinetics problems. Both problems describe adiabatic, homogeneous, gas phase chemical reactions at constant pressure, and include all three combustion regimes: induction, heat release, and equilibration. The comparisons show that LSODE is the most efficient code - in the sense that it requires the least computational work to attain a specified accuracy level. An important finding is that an iterative solution of the algebraic enthalpy conservation equation for the temperature can be more accurate and efficient than computing the temperature by integrating its time derivative.
M.G.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-13799 Stanford Univ., Calif.
MODEL REDUCTION FOR CONTROL SYSTEM DESIGN Ph.D. Thesis
Dale Frederick Enns 1984 306 p
Avail: Univ. Microfilms Order No. DA8420521

An approach and a technique for effectively obtaining reduced order mathematical models of a given large order model for the purposes of synthesis, analysis and implementation of control systems are developed. This approach involves the use of an error criterion which is the H infinity norm of a frequency weighted error between the full and reduced order models. The weightings are chosen to take into account the purpose for which the reducer order model is intended. A previously unknown error bound in the H infinity norm for reduced order models obtained from internally balanced realizations was obtained. This motivated further development of the balancing technique to include the frequency dependent weightings. This resulted in the frequency weighted balanced realization and a new model reduction technique. Two new approaches to designing reduced order controllers were also developed. The first involves reducing the order of a high order controller with appropriate weighting. The second involves linear quadratic Gaussian synthesis based on a reduced order model obtained with an appropriate weigting. Dissert. Abstr.

N85-13800*# Systems Technology, Inc., Hawthorne, Calif.
FLYING QUALITIES AND CONTROL SYSTEM CHARACTERISTICS FOR SUPERAUGMENTED AIRCRAFT Final Report
Thomas T. Myers, Duane T. McRuer, and Donald E. Johnston Dec. 1984 116 p refs
(Contract NAS2-11388)
(NASA-CR-170419; NAS 1.26:170419; STI-TR-1202-1) Avail: NTIS HC A06/MF A01 CSCL 01C

Aircraft-alone dynamics and superaugmented control system fundamental regulatory properties including stability and regulatory responses of the basic closed-loop systems; fundamental high and low frequency margins and governing factors; and sensitivity to aircraft and controller parameters are addressed. Alternative FCS mechanizations, and mechanizational side effects are also discussed. An overview of flying qualities considerations encompasses general pilot operations as a controller in unattended, intermittent and trim, and full-attention regulatory or command control; effective vehicle primary and secondary response properties to pilot inputs and disturbances; pilot control architectural possibilities; and comparison of superaugmented and conventional aircraft path responses for different forms of pilot control. Results of a simple experimental investigation into pilot dynamic behavior in attitude control of superaugmented aircraft configurations with high frequency time laps and time delays are presented. Author

N85-13801*# Calspan Advanced Technology Center, Buffalo, N.Y.
AN IN-FLIGHT INVESTIGATION OF A TWIN FUSELAGE CONFIGURATION IN APPROACH AND LANDING Final Report, Apr. - Dec. 1983
Norman C. Weingarten Hampton, Va. NASA. Langley Research Center Aug. 1984 87 p refs
(NASA Order L-61966-B; Contracts F33615-83-C-3603; F33615-79-C-3618)
(NASA-CR-172366; NAS 1.26:172366; CALSPAN-7205-4) Avail: NTIS HC A05/MF A01 CSCL 01C

An in-flight investigation of the flying qualities of a twin fuselage aircraft design in the approach and landing flight phase was carried out in the USAF/AFWAL Total In-Flight Simulator (TIFS). The objective was to determine the effects of actual motion and visual cues on the pilot when he was offset from the centerline of the aircraft. The experiment variables were lateral pilot offset position (0, 30 and 50 feet) and effective roll mode time constant (.6, 1.2, 2.4 seconds). The evaluation included the final approach, flare and touchdown. Lateral runway offsets and 15 knot crosswinds were used to increase the pilot's workload and force him to make large lateral corrections in the final portion of the approach. Results indicated that large normal accelerations rather than just vertical displacements in rolling maneuvers had the most significant degrading effect on pilot ratings. The normal accelerations are a result of large lateral offset and fast roll mode time constant and caused the pilot to make unnecessary pitch inputs and get into a coupled pitch/roll oscillation while he was making line up and crosswind corrections. A potential criteria for lateral pilot offset position effects is proposed. When the ratio of incremented normal aceleration at the pilot station to the steady state roll rate for a step input reaches .01 to .02 g/deg/sec a deterioration of pilot rating and flying qualities level can be expected. M.G.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-13802*# Remtech, Inc., Birmingham, Ala.
BOUNDARY LAYER SIMULATOR IMPROVEMENT Final Technical Report
Sarat C. Praharaj, Craig Schmitz, Cynthia Frost, Carl D. Engel, Charles E. Fuller, Robert L. Bender, and John Pond 8 Aug. 1984 133 p refs
(Contract NAS8-35976)
(NASA-CR-174199; NAS 1.26:174199; RTR-115-1) Avail: NTIS HC A07/MF A01 CSCL 14B

High chamber pressure expander cycles proposed for orbit transfer vehicles depend primarily on the heat energy transmitted from the combustion products through the thrust wall chamber wall. The heat transfer to the nozzle wall is affected by such variables as wall roughness, relamarization, and the presence of particles in the flow. Motor performance loss for these nozzles with thick boundary layers is inaccurate using the existing procedure coded BLIMPJ. Modifications and innovations to the code are examined. Updated routines are listed. A.R.H.

N85-13803# New Mexico Univ., Albuquerque. Engineering Research Inst.
ALTERNATIVES FOR RUNWAY RUBBER REMOVAL FROM POROUS FRICTION SURFACES
R. Gordon McKeen and Lary R. Lenke Washington FAA Jul. 1984 15 p refs Prepared in cooperation with Air Force Engineering and Services Center
(DOT/FAA/PM-84/28; ESL-TR-84-46) Avail: NTIS HC A02/MF A01

The touchdown areas of runways serving high-speed modern aircraft are subjected to impact by the tires during landing. A certain amount of rubber is removed due to heat and abrasion as aircraft tires spin up during landing. Rubber is deposited on the pavement surface as thin layers that adhere to the pavement materials. Subsequent rubber deposits increase the buildup to significant layer thicknesses. As the touchdown area becomes covered with rubber several problems are apparent. They are (1) obliteration of pavement markings, (2) reduced wet skid resistance, and (3) accumulation of loose debris on the runway surface. Maintenance action is required to eliminate or reduce these problems to acceptable levels. Painting of pavement markings is a regular activity at all active airports; sweeping of runways is performed to remove loose debris, and rubber removal is performed to restore skid characteristics of the pavement surface. This report is concerned specifically with the problems involved in removal of rubber deposits from porous friction course (PFC) or porous friction surface (PFS). B.W.

N85-13804# Department of the Navy, Washington, D. C.
PREFABRICATED PANELS FOR RAPIDLY RUNWAY REPAIR AND EXPEDIENT AIRFIELD SURFACING Patent Application
P. S. Springston and R. L. Claxton, inventors (to Navy) Filed 17 Jul. 1984 14 p
(AD-D011277; US-Patent-Appl-SN-631954) Avail: NTIS HC A02/MF A01 CSCL 01/5

Low profile portable panels consisting of fiberglass-reinforced plastic composite mats which include hollow in-organic silica spheres in the plastic resin to reduce weight have recessed molded lips and bushings along all edges for connecting panels together with bolts to form expedient airfield surfacing and repair having high flexural strength and high structural capacity. GRA

N85-13805# Oak Ridge National Lab., Tenn.
EVALUATION OF ARCTIC TEST OF IMPROVED TRITIUM RADIOLUMINESCENT LIGHTING Final Report, Nov. - Dec. 1983
K. W. Haff, J. A. Tompkins, L. J. Hult (USAF Alaskan Air Command, Elmendorf AFB, Alaska), and C. L. Bupp (USAF Alaskan Air Command, Elmendorf AFB, Alaska) Jun. 1984 70 p
(Contract DE-AC05-84OR-21400)
(DE84-014887; DOE/OR-21400/T35; ESL-TR-84-19) Avail: NTIS HC A04/MF A01

A test was conducted to determine if the improved generation of tritium radioluminescent runway lighting could effectively support aircraft operations in the Alaskan winter environment. The lighting system was unidirectional and consisted of threshold and touchdown zone lights (each end), edge lights, and Visual Approach Slope Indicator (VASI) lights. The primary lighting layout tested as similar to that required by Military Airlift Command (MAC) regulations for C-130 operations. Nearly all pilots rated the ruway lights satisfactory for use at tactical operating locations. Visual acquisition range was 3 to 5 miles under dark conditions. This distance was decreased by ambient lighting conditions. Pilots landing into the twilight of a setting Sun reported as little as 1 mile acquisition range. The VASI system did not fare as well and was rated marginal by pilots. Increasing the number of radioluminescent (RL) panels used and the distance between the panels significantly improved acquisition and usable ranges. The titanium lights were extremely durable throughout the test. They required no maintenance except an occasional wipe off, and there were no failures or security violations. DOE

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-13806# Fairchild Space and Electronics Co., Germantown, Md.
TECHNICAL SUPPORT SERVICES FOR SPACE AND TERRESTRIAL SYSTEMS PROGRAMS Status Report, 1 Feb. - 29 Feb. 1984
15 Mar. 1984 17 p
(Contract DE-AC01-81NE-32090)
(DE84-009031; FSC/ESD-217/84/276) Avail: NTIS HC A02/MF A01

Information is presented concerning the development of radioisotope thermoelectric generators for space applications. Budget information is also included. DOE

N85-13822# Centre National d'Etudes Spatiales, Toulouse (France).
THE LAUNCH WINDOW OF A GEOSTATIONARY SATELLITE [CRENEAU DE TIR D'UN SATELLITE GEOSTATIONNAIRE]
H. Donat *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 507-525 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

N85-13828# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/AE.
CHOICE OF ORBIT FOR SCIENTIFIC SATELLITES: SIGMA, THE SUBMILLIMETER TELESCOPE [CHOIX DE L'ORBITE DE SATELLITES SCIENTIFIQUES: SIGMA - TELESCOPE SUB-MILLIMETRIQUE]
D. Forcioli *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 695-720 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

N85-13885*# ECON, Inc., Princeton, N. J.
EVALUATING NASA TECHNOLOGY PROGRAMS IN TERMS OF PRIVATE SECTOR IMPACTS
Joel S. Greenberg *In* NASA. Lewis Research Center Space Power Apr. 1984 p 45-50 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 22A

N85-13886*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MISSIONS/PLANNING PANEL
J. Stuart Fordyce *In its* Space Power Apr. 1984 p 57 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 22A

N85-14477# Nijmegen Univ. (Netherlands). Dept. of Biochemistry.
SPACE STATION: NEW FRONTIER FOR LIFE SCIENCES IN SPACE
Sjoerd L. Bonting *In* ESA Life Sci. Res. in Space Aug. 1984 p 287-292 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-13807# Centre National d'Etudes Spatiales, Toulouse (France). Div. Mathematiques Spatiales.
SATELLITE MOTION: LECTURES AND EXERCISES ON SPACE MECHANICS
1984 862 p refs In FRENCH Presented at Toulouse, 1983 (ISBN-2-85428-114-4) Avail: NTIS HC A99/MF A01

Calculation of satellite orbits, attitude, and position is introduced. Computing facilities of the French Space Agency are described. Mission analysis in spatial mechanics is outlined. Formulas used in calculating satellite motion are listed. A set of exercises based on the concepts explained is presented. For individual titles, see N85-13808 through N85-13832.

N85-13808# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS.
KEPLERIAN AND PERTURBED MOTION [MOUVEMENTS KEPLERIEN ET PERTURBE]
J. Bernard *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 27-86 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The general principals of classical mechanics, the two body problem, the many body problem, and the notion of Newtonian potential are recalled. Keplerian motion of an object near a celestial body, orbit determination, orbital elements, orbit perturbation, and maneuvers in Keplerian orbit are introduced. Author (ESA)

N85-13809# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS.
REFERENCES IN SPACE AND TIME [LES REPERES DE L'ESPACE ET DU TEMPS]
F. Nouel *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 87-127 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Astronomical and terrestrial reference systems are introduced. Variations of the fundamental planes (precession, nutation, rotation, translation) are outlined. Astronomical and atomic time measures are explained. Author (ESA)

N85-13810# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS.
ORBIT PERTURBATION [LES PERTURBATIONS D'ORBITE]
G. Campan *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 129-163 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Conservative and nonconservative forces which perturb satellite orbits are introduced. The effects of the Earth gravitational potential on orbital parameters is discussed. The lunar-solar potential, the influence of solar radiation pressure and friction effects are explained. Author (ESA)

N85-13811# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS.
ORBIT EXTRAPOLATION [LES EXTRAPOLATIONS D'ORBITE]
O. Zarrouati and An. L. Comps *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 165-236 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Analytical models used in satellite orbit computations, including solution of the Lagrange equations, the Hamiltonian method, and a general first order method are introduced. The stroboscopic method for orbit computation is explained. The principals of numerical integration are outlined. Numerical techniques can be applied rapidly, are very accurate, can account for complex forces, and can change force model easily. However, the solution is valid only for a short time interval, the various perturbations are mixed, and they require a large amount of calculation. Analytical model solutions are valid over longer time spans, can separate the various perturbations, and are economical as to calculations. Preparatory work is long, however, and accuracy is lost by necessary simplifications of complex forces. Author (ESA)

N85-13812# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS.
MEASUREMENTS IN SATELLITE ORBIT TRACING [LES MESURES EN ORBITOGRAPHIE]
D. Zobler *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 237-293 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Measurements used to compare real satellite orbits with their models are explained. Raw measurements, including angular measurements, distance measurement, Doppler measurement, and reference system definition are covered. Preprocessing of 2 GHz ground-based distance measurements, and tropospheric and ionospheric refraction data is outlined. Modeling of measurements from ground stations is introduced. Orbit determination calculations to enable ground antennas to be pointed at the satellite are summarized. Author (ESA)

N85-13813# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS.
SATELLITE ORBIT DETERMINATION [LA RESTITUTION D'ORBITE]

P. Legendre *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 295-318 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Statistical methods for determining satellite trajectories after being put into orbit, after changes in the trajectory and at regular intervals during orbital lifetime are outlined. The least squares method, a differential Gauss-Newton correction algorithm, and interpretation of the results are introduced. Author (ESA)

N85-13814# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS/CD.
SATELLITE ATTITUDE DETERMINATION [LA RESTITUTION D'ATTITUDE]
J. Foliard and J. C. Kosik *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 319-368 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The use of data on center of gravity motion to determine satellite attitude for scientific and telecommunication missions is discussed. The reference systems used, determination of the attitude matrix, and geometrical and dynamic approaches to attitude determination are outlined. Utilization of sensors to measure solar direction, Earth magnetic field, stellar position, and Earth center as reference directions is explained. Author (ESA)

N85-13815# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS/AE.
RELATIONSHIPS BETWEEN ARIANE TRAJECTORIES AND SATELLITE ORBITS [RELATIONS TRAJECTOIRES ARIANE: ORBITE SATELLITE]
G. Oyharcabal *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 369-394 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The use of the Ariane launch vehicle to put satellites into geostationary orbit; orbital accuracy attainable with Ariane; and satellite pointing accuracy at launcher-payload separation are discussed. Orbit analysis using information transmitted by the launch vehicle and ground-based radar tracking is summarized. The first acquisition of the satellite after separation is described. Author (ESA)

N85-13816# Centre National d'Etudes Spatiales, Toulouse (France). Div. DTI/MS/CD.
TERRESTRIAL LOCATING [LA LOCALISATION TERRESTRE]
B. BoucherdelaRupelle *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 395-416 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The use of spaceborne Doppler radar to pinpoint buoys used for ocean data acquisition and search and rescue missions is described. The ARGOS oceanography project, involving position estimation of 4000 buoys in 24 hr with 1 km accuracy, and the SARGOS search and rescue project, locating 40 buoys within 90 min with accuracy of a few kilometers, are outlined. Author (ESA)

N85-13817# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/S/OG.
THE 2 GHz NETWORK AND THE NETWORK OPERATIONS CENTER [LE RESEAU 2 GHz ET LE COR] c14
A. Mazain *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 417-444 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The French Space Agency satellite tracking ground station network is described. It consists of stations in France, South Africa and French Guyana, compatible with the NASA STDN and DSN networks. The data reception, control transmission, distance measurement, Doppler measurement, angular measurement, remote control and monitoring, message processing, and satellite antenna control facilities are summarized. The video data distribution system, voice communication system, and computer capacity of the network operations center are presented. Author (ESA)

N85-13818# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/CI/LS.
THE CDC: FACILITIES ON OFFER FROM THE CNES COMPUTING CENTER FOR SPACE MATHEMATICS (A LOOK AT THE CAPACITIES OF CDC COMPUTERS) [LE CDC: MOYENS OFFERTS PAR LE CENTRE INFORMATIQUE DU CNES AUX MATHEMATIQUES SPATIALES (APERCU DES POSSIBILITES DES ORDINATEURS C.D.D.)] c60
D. Galarreta *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 445-457 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The hardware and software of the French Space Agency computing center are described. The center has 2 CDC Cyber 170/750 computers with the usual peripherals, accessible via a telecommunication network. The operating system is a Network Operating System/Batch Environment (NOS/BE). The NOS/BE is supported by INTERCOM (to link remote terminals to the central unit); the CDC Cyber Record Manager; the FORM file formatter; the UPDATE file maintenance program and the CDC Cyber loader. The subprogram libraries include 180 mathematics programs, the International Mathematical Statistical Libraries (420 modules), the Math and Science Library (400 programs) and the MSLIB spatial mechanics library (200 modules). Author (ESA)

N85-13819# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/CM/SM.
THE FACILITIES OF THE CALCULATION CENTER AND REAL TIME ROOM FOR SATELLITE POSITIONING [LES MOYENS DU CIMTT EN MISE A POSTE] c60
F. X. Boisserie *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 459-465 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The computer facilities of a satellite ground control center used for positioning satellites are described. The center has a SOLAR 16/65 SAT1 and SAT2 minicomputer. They use the RTESD real time software (FORTRAN-T) and are linked to disk storage units, magnetic tape recorders, printers, alphanumeric display devices, a graphics terminal, and a graphics recorder. Author (ESA)

N85-13820# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/CD.
THE SATELLITE MANEUVERS DETERMINATION DEPARTMENT [LE S.D.M.: SERVICE DE DETERMINATION DES MANOEUVRES]
H. Donat *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 467-479 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The organization of a center responsible for coordinating satellite orbital and attitude maneuvers after the satellite attains its working orbit is outlined. The center oversees the satellite tracking, orbit determination, and real time computing facilities (including data processing and dissemination of results). It is involved in prelaunch preparations, execution of the flight plan, and acquisition of flight data. Author (ESA)

N85-13821# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/OG.
THE OPERATIONAL ORBIT TRACKING CENTER [LE CENTRE D'ORBITOGRAPHIE OPERATIONELLE (COO).] c14
A. Mazain *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 481-504 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The organization, functions, computing facilities, and installations of a satellite ground support center are described. The center is responsible for acquiring position data; orbit determination;

informing clients of satellite overflight times; analyzing and correlating orbit calculation results; analyzing and following up tracking network performance; collecting orbital parameters from other space agencies; running an orbit data base; and operating tracking software. It uses 2 CDC 750 computers and 2 SOLAR SAT minicomputers. Author (ESA)

N85-13822# Centre National d'Etudes Spatiales, Toulouse (France).
THE LAUNCH WINDOW OF A GEOSTATIONARY SATELLITE [CRENEAU DE TIR D'UN SATELLITE GEOSTATIONNAIRE] c12
H. Donat *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 507-525 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Launch vehicle and satellite design constraints on putting satellites into geosynchronous orbits are reviewed, and the calculation of the TELECOM 1 launch window is summarized. The main satellite constraints were solar aspect angle, eclipse duration, position of eclipses, attitude determination accuracy, and infrared sensor operation. Author (ESA)

N85-13823# Centre National d'Etudes Spatiales, Toulouse (France).
SATELLITE POSITIONING [LA MISE A POSTE]
P. Escudier *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 527-568 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Operations involved in putting a satellite into geosynchronous orbit from transfer orbit are discussed. Spin and three axis stabilization in transfer orbit are reviewed. Velocity increase required for positioning in the final orbit; satellite attitude, excentricity and drift correction; transfer orbit optimization; and positioning maneuver optimization are discussed. Optimization of transfer orbit parameters in the case of a double launch in which only one satellite has north-south attitude control is outlined. Author (ESA)

N85-13824# Centre National d'Etudes Spatiales, Toulouse (France).
PERTURBATIONS IN GEOSTATIONARY ORBIT [LES PERTURBATIONS DE L'ORBITE GEOSTATIONNAIRE]
F. Alby *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 569-611 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The natural evolution of geostationary satellite orbits due to Moon-Sun attraction, geopotential, and solar radiation pressure is described. Orbit correction calculations, including velocity vector, thrust effects, and geometrical representation are outlined. Author (ESA)

N85-13825# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/CD.
STATIONKEEPING STRATEGIES FOR GEOSTATIONARY SATELLITES [STRATEGIES DE MAINTIEN A POSTE DES SATELLITES GEOSTATIONNAIRES]
B. Belon *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 613-642 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

North-south and east-west stationkeeping strategies for synchronous satellites are described. The concept of stationkeeping window, i.e., the amount of error (usually + or - 0.1 deg) permissible is defined. In north-south stationkeeping, fuel costs are constant, since only secular variations are corrected. In cases without constraints, correction can be achieved by reversing drift direction, or by integration with the east-west correction. If there are constraints, the satellite is guided so as to be at one extreme of the window at the start of the constraint period, and at the other extreme at the end of the period. In east-west stationkeeping, longitudinal and excentricity errors must be corrected. Longitudinal errors are corrected indirectly, after drift correction. Eccentricity is corrected by tangential thrust. Author (ESA)

N85-13826# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/AE.
HELIOSYNCHRONISM AND PHASING. APPLICATION TO THE SPOT ORBIT [HELIOSYNCHRONISME ET PHASAGE. APPLICATION A L'ORBITE SPOT]
S. Daillet and C. Darrigan *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 643-669 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The advantages of heliosynchronous, phased orbits for remote sensing satellites such as SPOT are recalled; the evolution of a heliosynchronous phased orbit is outlined; and routine SPOT orbital maneuvers are described. A heliosynchronous orbit permits optimal use of solar panels, and assures that lighting conditions and other diurnally varying parameters are similar at each passage. Phasing enables successive images of a scene to be made at the same viewing angle. Methods to calculate heliosynchronism and phasing are shown. Author (ESA)

N85-13827# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/AE.
INTERPLANETARY TRAJECTORIES [TRAJECTOIRES INTERPLANETAIRES]
J. Bernard *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 671-694 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Methods of solving the equations of motion of an interplanetary probe are presented. The notion of sphere of influence is defined. Solving the three body problem by the Jacobi method, and the method of juxtapositioned cones are discussed. The conditions for leaving a planet, and interplanetary transfer are explained. Hohmann's transfer method is outlined. Launch window, maneuvers on approaching a planet, and gravity assist are considered. Author (ESA)

N85-13828# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/AE.
CHOICE OF ORBIT FOR SCIENTIFIC SATELLITES: SIGMA, THE SUBMILLIMETER TELESCOPE [CHOIX DE L'ORBITE DE SATELLITES SCIENTIFIQUES: SIGMA - TELESCOPE SUBMILLIMETRIQUE] c12
D. Forcioli *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 695-720 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Two excentric orbits for a gamma ray astronomical cartography mission (SIGMA satellite) are compared; choice of orbit of a satellite-borne submillimeter wave telescope to study the Suyaev-Zeldovich effect (cosmic radiation variations due to a Hot Big Bang) is discussed. For SIGMA, an orbit with perigee = 13,000 km, apogee = 200,000 km is favored. For the telescope, a geosynchronous and a 4 day excentric orbit are suitable. Author (ESA)

N85-13829# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/AE.
NATURAL ATMOSPHERIC REENTRY [RENTREE ATMOSPHERIQUE NATURELLE]
P. Escudier *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 721-748 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Modeling atmospheric friction effects on satellites and modeling the atmosphere are discussed. Cook's model of aerodynamic drag is described. Analytical and numerical integration solutions for the orbit of a satellite subject to atmospheric friction are considered. The atmospheric arc (reentry trajectory) of a satellite similar to COSMOS 1402 is shown. Author (ESA)

N85-13830# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/CD.
THE SEARCH AND RESCUE SATELLITE AIDED TRACKING (SARSAT) EXPERIMENT. PRESENTATION OF CNES PROCESSING FOR THE SARGOS PROJECT: CONTEXT AND ORBIT PROCESSING [EXPERIENCE SARSAT. PRESENTATION DES TRAITEMENTS CNES POUR LE PROJET SARGOS: CONTEXTE ET TRAITEMENT DE L'ORBITE SOMMAIRE]
A. L. Comps *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 749-781 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

Software for the SARGOS satellite project which locates radio buoys from ships or aircraft in distress is described. The software is used for orbit calculations of NOAA-8 satellite. It calculates actual position and predicts satellite position for 1 1/2 days ahead. It is accurate to within 1 km along track, 0.5 km perpendicular to orbital plane, and 0.3 km radially. The buoys are located to within < 5 km in 89% of cases, which is better than the specification.
Author (ESA)

N85-13831# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/CD.
THE MOTION OF THE EARTH BY DOPPLER OBSERVING CAMPAIGN (MEDOC) [EXPERIENCE MEDOC] c43
Y. Labrune *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 783-809 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The Motion of the Earth by Doppler Observing Campaign (MEDOC) 2, experiment organization, data acquisition, and data processing algorithms are described. The MEDOC 2 experiment uses TRANSIT satellites to create a worldwide coordinate reference system, and to calculate the movement of the Earth's axis of rotation to within 20 cm per day. The data collected will also be used in estimating point positions with 50 cm absolute accuracy, or 20 cm relative accuracy. Polar wandering can be measured to within 15 cm. Author (ESA)

N85-13832# Centre National d'Etudes Spatiales, Toulouse (France).
SPATIAL MECHANICS FORMULAS AND EXERCISES [FORMULAIRE]
In its Satellite Motion: Lectures and Exercices on Space Mech. 1984 p 813-862 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

The formulas for Keplerian motion, perturbed motion (Gauss and Lagrange equations), heliosynchronism, orbit phasing, and perturbation of geostationary orbit are presented. Exercises for students of satellite motion are given. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N85-13833# Committee on Commerce, Science, and Transportation (U. S. Senate).
VANDENBERG SPACE SHUTTLE LAUNCH COMPLEX
Washington GPO 1984 29 p Hearing before the Committee on Commerce, Science, and Transportation, 98th Congr., 1st Sess., 10 Sep. 1984
(S-Hrg-98-1075; GPO-39-626) Avail: Subcommittee on Science, Technology and Space

The accuracy of allegations concerning construction deficiency and quality control failures at the space shuttle launch and landing site in California is assessed. Results of investigations conducted and measures taken to resolve problems encountered are delineated. For individual titles, see N85-13834 through N85-13835.

N85-13834# Committee on Commerce, Science, and Transportation (U. S. Senate).
STATEMENT OF EDWARD C. ALDRIDGE, JR., UNDER SECRETARY OF THE AIR FORCE, DEPARTMENT OF THE AIR FORCE, ACCOMPANIED BY LIEUTENANT GENERAL ROBERT W. BAZLEY, INSPECTOR GENERAL AND BRIGADIER GENERAL DONALD J. KUTYNA, DIRECTOR OF SPACE SYSTEMS AND COMMAND, CONTROL AND COMMUNICATIONS, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION
In its Vandenberg Space Shuttle Launch Complex 1984 p 2-19 Washington GPO (For primary document see N85-13833 05-14)
Avail: Subcommittee on Science, Technology and Space

Response of the United States Air Force to accusations levied by NBC News concerning the safety of the space shuttle launch and landing site at Vendenberg Air Force Base is described. Investigations of defective welds, out-of-phase wiring, and valve and cable contamination are reported and measures taken to assure quality control are discussed. Program management, contractor responsibility, and subcontractor performance are also discussed. A.R.H.

N85-13835# Committee on Commerce, Science, and Transportation (U. S. Senate).
STATEMENT OF HONORABLE JAMES M. BEGGS, ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Vandenberg Space Shuttle Launch Complex 1984 p 20-26 Washington GPO (For primary document see N85-13833 05-14)
Avail: Subcommittee on Science, Technology and Space CSCL 22D

The quality control methodology and procedures of the Vandenberg shuttle project were deemed adequate based on observations of NASA personnel located on site. No impact on the space shuttle program on the present or future is foreseen, although any delay in activation of the Vendenberg would affect DOD planned STS launches from that location. Shuttle schedules for the year are discussed as well as the possibility of retrieving the Palapa B-2 and Westar 6 satellites. A.R.H.

N85-13817# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/S/OG.
THE 2 GHz NETWORK AND THE NETWORK OPERATIONS CENTER [LE RESEAU 2 GHz ET LE COR]
A. Mazain *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 417-444 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

N85-13821# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/OG.
THE OPERATIONAL ORBIT TRACKING CENTER [LE CENTRE D'ORBITOGRAPHIE OPERATIONELLE (COO).]
A. Mazain *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 481-504 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

No abstracts in this category.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-13836 California Univ., Los Angeles.
A DISTRIBUTED EXPERT SYSTEM FOR SPACE SHUTTLE FLIGHT CONTROL Ph.D. Thesis
John Joseph Helly 1984 111 p
Avail: Univ. Microfilms Order No. DA8420187

A new representation of malfunction procedure logic, based on the programmable logic array, which facilitates the automation of these procedures for real time detection and analysis of spacecraft anomalies using Boolean normal forms is presented. Processing of anomalies makes explicit use of time to permit monotonic reasoning in the form of partial system resets corresponding to recovery of system functions through operator intervention. A methodology for the synthesis of new rules is developed which permits the modification of the rule base both dynamically, in real time as part of the systems monitoring function, and statically, as part of a systems analysis. A distributed architecture for expert systems based on an extension of the programmable logic array is introduced. This representation is discussed in the context of Space Shuttle systems and has general applicability to the control and monitoring of complex systems. Dissert. Abstr.

N85-13837 Stanford Univ., Calif.
EXPERIMENTS IN CONTROL OF FLEXIBLE STRUCTURES WITH UNCERTAIN PARAMETERS Ph.D. Thesis
Dan Rosenthal 1984 180 p
Avail: Univ. Microfilms Order No. DA8420612

Control requirements for large flexible space structures are difficult to meet in the presence of model uncertainty. The control system is particularly sensitive to spacecraft properties when the sensor and actuator used for control are separated by structural flexibility, i.e., they are noncolocated. A laboratory structure was built which incorporates several aspects of the problem posed by large space structures: (1) the laboratory system has extremely low damping ratios in the vibration modes; (2) the system is equipped with noncolocated sensor and actuator; (3) some of the system parameters can be changed abruptly while the system is under closed loop control. The laboratory system provides a setting in which suitable control algorithms can be developed and tested, for providing control which is insensitive or robust to plant model errors. Controllers were synthesized using gradient search programs. Experimental results are presented which indicate the extent to which nominal performance must be traded off to achieve robustness. These results are also compared to results that can be obtained using classical control theory and modern optimal control methods. Dissert. Abstr.

N85-13838*# Control Dynamics Co., Huntsville, Ala.
DEFINITION OF GROUND TEST FOR VERIFICATION OF LARGE SPACE STRUCTURE CONTROL Final Report, 30 Sep. 1980 - 31 Jul. 1984
George B. Doane, III, John R. Glaese, Danny K. Tollison, Thomas Howsman, Sally Curtis, ed., and Betsy Banks Nov. 1984 157 p refs
(Contract NAS8-34700)
(NASA-CR-171208; NAS 1.26:171208) Avail: NTIS HC A08/MF A01 CSCL 22B

Control theory and design, dynamic system modelling, and simulation of test scenarios are the main ideas discussed. The overall effort is the achievement at Marshall Space Flight Center of a successful ground test experiment of a large space structure. A simplified planar model of ground test experiment of a large space structure. A simplified planar model of ground test verification was developed. The elimination from that model of the uncontrollable rigid body modes was also examined. Also studied was the hardware/software of computation speed. For individual titles, see N85-13839 through N85-13847.

N85-13839*# Control Dynamics Co., Huntsville, Ala.
LEVEL OF EFFORT
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 p 2-13 refs (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

The generation of a planar model of the ground test experiment structure is examined. This was done by adapting an in-house modal analysis code (Gimbalflex) to allow placement of sensors and actuators at certain locations on the structure. The next step in the development of this model was to adapt if for use with the control pole placement algorithm. The uncontrollable rigid body mode was removed from the model. This uncontrollable mode was due to the pointing of the gimbal. Control system design for the planar model was also initiated. A digital controller was planned utilizing the Control Pole Placement technique. The existence of rate of state feedback was assumed. Once this controller and other control algorithms were developed, it became necessary to conduct speed tests. A study was then made of additional hardware/software necessary to meet the speed requirement.E.R.

N85-13840*# Control Dynamics Co., Huntsville, Ala.
ORAL PRESENTATION OF FIRST YEAR FINAL REPORT, APPENDIX A
In its Definition of Ground Test for Verification of of Large Space Struct. Control Nov. 1984 28 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

Plans for self contained in-house capability to test Large

Space Structures (LSS) and their control prior to flight are presented. A ground test facility which demonstrates and validates LSS control theory is defined. An experiment is designed which assures a high success rate for flight test. A strapdown algorithm is developed. Research on the astromast is reported, as is the development of an overall system model. E.R.

N85-13841*# Control Dynamics Co., Huntsville, Ala.
SIMPLIFIED PLANAR MODEL OF GROUND TEST VERIFICATION STRUCTURE, APPENDIX B Monthly Progress Report, 1-31 Oct. 1982
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 2 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

The planar version of the structure is shown for which a model was developed. The model is 12th order including 6 structural modes. One mode results from the base translation, one from the gimbal rotation, three from the flex characteristics of the Astromast Boom and gyro package, and one from the tether and tripod. The model includes one input, one disturbance and one output which are a control torque at the gimbal, a translational force at the base, and the rotation rate of the Astromast tip, respectively.
Author

N85-13842*# Control Dynamics Co., Huntsville, Ala.
ELIMINATION OF UNCONTROLLABLE RIGID BODY MODE, APPENDIX C
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 6 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

The planar system model is examined which reveals two rigid body modes. One is due to the pure translation of the whole experiment assembly and is uncontrollable because the only control input is a torque at the gimbal. The other rigid body mode is due to the pointing of the gimbal and is the one for which control is sort. The problem arises from the Vector V2 which relates the control input to the modal coordinates. Since its fifth and sixth elements are both nonzero, neither body mode can be thrown away as is. The two rigid body modes must be transformed so that one is unaffected by the control input and one is left controllable. The uncontrollable mode can then be eliminated from the model for design purposes. A process is described to accomplish the elimination of the uncontrollable rigid body mode.
E.R.

N85-13843*# Control Dynamics Co., Huntsville, Ala.
SPEED TEST RESULTS AND HARDWARE/SOFTWARE STUDY OF COMPUTATIONAL SPEED PROBLEM, APPENDIX D
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 5 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

The HP9845C is a desktop computer which is tested and evaluated for processing speed. A study was made to determine the availability and approximate cost of computers and/or hardware accessories necessary to meet the 20 ms sample period speed requirements. Additional requirements were that the control algorithm could be programmed in a high language and that the machine have sufficient storage to store the data from a complete experiment. E.R.

N85-13844*# Control Dynamics Co., Huntsville, Ala.
SECTION 1. METHOD OF DETERMINING MODE SHAPES AND NATURAL FREQUENCIES OF THE NASA UNMODIFIED TEST STRUCTURE. SECTION 2. CONTINUOUS BEAM CLOSED FROM SOLUTION TO THE NASA-LSS ASTROMAST TORSIONAL VIBRATION, APPENDIX E
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 26 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

The methods used to determine the lower natural frequencies and their corresponding mode shapes of the NASA-LSS Astromast (Unmodified Test Structure), and the mass integrals associated with the mode shapes are illustrated. The test structure is modeled as a cantilever beam with 91 lumped masses and without the tip mass on the free end of the bram. This uncouples the torsion and bending modes and allows for them to be determined separately. The frequency range was limited to an upper bound of 100 rad/sec (15.92 Hz.). In this range from 0.-100. rad/sec, three bending frequencies and one torsion frequency was found.
Author

N85-13845*# Control Dynamics Co., Huntsville, Ala.
DEFINITION OF GROUND TEST FOR LARGE SPACE STRUCTURE (LSS) CONTROL VERIFICATION, APPENDIX G
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 44 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

A Large Space Structure (LSS) ground test facility was developed to help verify LSS passive and active control theories. The facility also perform: (1) subsystem and component testing; (2) remote sensing and control; (3) parameter estimation and model verification; and (4) evolutionary modeling and control. The program is examined as is and looks at the first experiment to be performed in the laboratory. E.R.

N85-13846*# Control Dynamics Co., Huntsville, Ala.
REVIEW OF TECHNICAL PAPERS, APPENDIX H
In its Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 10 p refs (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

Ten (10) papers reviewed deal directly with control systems of large space structures, such as observer designs or closed loop pole placement methods. Of the ten papers there are three principle concepts treated: observers, closed loop pole placement and a disturbance isolation technique. Three of the ten papers were selected for critical review as they embodied the three basic concepts. The objectives of the review were: (1) Check and verify the equations and derivations; (2) Relate these new techniques to standards in the literature; (3) Identify strengths and weaknesses of the methods; and (4) Determine suitable topics for further study using these methods.
Author

N85-13847*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GROUND TEST EXPERIMENT FOR LARGE SPACE STRUCTURES, APPENDIX I
Danny K. Tollison (Control Dynamics Co.) and Henry B. Waites *In* Control Dyn. Co. Definition of Ground Test for Verification of Large Space Struct. Control Nov. 1984 4 p (For primary document see N85-13838 05-18)
Avail: NTIS HC A08/MF A01 CSCL 22B

Marshall Space Flight Center has developed a Large Space Structure (LSS) ground test verification experiment facility having adequate fidelity and flexibility to accommodate the demands of LSS control theory testing. The first experiment is in the subsystem verification and integration phase. This test employs the ASTROMAST, a lightweight S glass composite deployable beam structure, as the test article and is cited to prove out centralized and distributed sensor control strategies.
Author

N85-13848# Department of the Air Force, Washington, D.C.
PROPELLANT TANK RESUPPLY SYSTEM Patent Application
T. F. Schweickert, inventor (to Air Force) Filed 14 Aug. 1984 12 p
(AD-D011288; US-Patent-Appl-SN-640636) Avail: NTIS HC A02/MF A01 CSCL 13/4

The present invention relates generally to improvements in attitude control systems (ACS) for spacecraft and more particularly to a novel propellant tank resupply system and method for increasing ACS propellant usage capability through resupply of

the ACS tanks during operation of the engines of the primary propulsion system. GRA

N85-13849# British Aerospace Aircraft Group, Bristol (England).
SPACECRAFT STRUCTURAL ACOUSTIC STUDIES: DEVELOPMENT OF STRUCTURAL ACOUSTIC DESIGN GUIDES Final Report
R. J. Cummins and W. Cooper Paris ESA Dec. 1983 208 p refs
(Contract ESA-4118/79/NL-AK)
(ESA-CR(P)-1916) Avail: NTIS HC A10/MF A01

Statistical energy analysis techniques for predicting spacecraft structural response and equipment vibration were developed, using the General Statistical Energy Program (GENSTEP). Modal density, dissipation, and coupling loss factors were evaluated for a wide range of spacecraft structures. Results show the need to improve GENSTEP for coincidence and ring frequencies. For modal density, area is the important parameter, panel/plate shape being insignificant. A formulation for predicting antenna modal density is needed. The energy and decay methods of calculating dissipation loss give similar results. A three channel method for experimental evaluation of modal density is proposed. Vibration level measurements with equipment boxes on a honeycomb platform show that platform and boxes can be tested in isolation in the acoustic field. Damping tape is useful below 600 Hz and above 1500 Hz. Point dampers give an average reduction in vibration level of 3 dB over a wide frequency range. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-13850*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN ASSESSMENT OF INTEGRATED FLYWHEEL SYSTEM TECHNOLOGY
Claude R. Keckler, ed., Robert T. Bechtel, ed. (NASA. Marshall Space Flight Center), and Nelson J. Groom, ed. Washington Nov. 1984 419 p refs Workshop held in Huntsville, Ala., 7-9 Feb. 1984
(NASA-CP-2346; L-15876; NAS 1.55:2346) Avail: NTIS HC A18/MF A01 CSCL 10B

The current state of the technology in flywheel storage systems and ancillary components, the technology in light of future requirements, and technology development needs to rectify these shortfalls were identified. Technology efforts conducted in Europe and in the United States were reviewed. Results of developments in composite material rotors, magnetic suspension systems, motor/generators and electronics, and system dynamics and control were presented. The technology issues for the various disciplines and technology enhancement scenarios are discussed. A summary of the workshop, and conclusions and recommendations are presented. For individual titles, see N85-13851 through N85-13879.

N85-13851*# California Univ., Livermore. Lawrence Livermore Lab.
ROTATING ASSEMBLY WORKING GROUP SUMMARY c44
Satish V. Kulkarni *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 7-24 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The feasibility of a fail safe flywheel system was demonstrated. Three of the major advantages of flywheel systems are: longer operational life, higher electrical efficiency, and higher system energy density. The use of composite material flywheels is important to realize these advantages. Rotor design and dynamics, rotor materials and fabrication, safety, nondestructive testing, and systems operation loads and environment, are outlined. E.A.K.

N85-13852*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ELECTROMECHANICAL/ELECTROMAGNETICS WORKING GROUP SUMMARY c44
David B. Eisenhaure *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 25-28 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The component and system technology issues associated with suspension and power conversion systems for the flywheel were discussed. The development of the technology consists of three major steps and encompasses a complementary mix of analytical efforts and hardware development for validation of design approaches and concept implementations. The major elements included: (1) studies to determine the optimal system configuration considering gimballed and nongimballed wheel concepts and incorporating the best 1984 component technology. These studies must also address the impact of rotor configuration on other elements of the system such as motor/generators and magnetic suspension systems to permit the selection of the optimal configuration for the demonstration phase; (2) focus the development program on integration and demonstration of a complete system which includes the rotor, suspension, and power conversion subsystems which emphasis efficiency; (3) conduct a technology program on motor/generators, suspension systems, gimbals, and sensors to take advantage of known technological advances. E.A.K.

N85-13853*# TRW Systems Group, Redondo Beach, Calif.
ELECTRICAL/ELECTRONICS WORKING GROUP SUMMARY c44
Arthur D. Schoenfeld *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 29-38 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The electrical/electronics, technology area was considered. It was found that there are no foreseeable circuit or component problems to hinder the implementation of the flywheel energy storage concept. The definition of the major component or technology developments required to permit a technology ready date of 1987 was addressed. Recommendations: motor/generators, suspension electronics, power transfer, power conditioning and distribution, and modeling. An introduction to the area of system engineering is also included. E.A.K.

N85-13854*# Rockwell International Corp., Downey, Calif.
DYNAMICS AND CONTROLS WORKING GROUP SUMMARY c44
Ronald E. Oglevie *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 39-48 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The technology status of the dynamics and controls discipline as it applies to energy storage wheel systems was evaluated. No problems were identified for which an adequate solution could not be proposed. Design issues that influence control were addressed. The dynamics and control aspects associated with the energy storage system concept and its various constituent parts, and the

control tasks attendant to large, manned spacecraft are discussed. E.A.K.

N85-13855*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SUMMARY OF THE 1983 INTEGRATED FLYWHEEL TECHNOLOGY WORKSHOP c44
Claude R. Keckler *In its* An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 49-64 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The use of flywheels to perform the functions of attitude control and/or energy storage on a variety of space missions was studied. Integrated Flywheel Technology was discussed. The four primary objectives are: (1) determine the potential of flywheels for energy storage system applications and for combined energy storage and attitude control concepts; (2) assess the state of the art (SOA) in integrated flywheel technology through a review of government sponsored programs; (3) identify those technology areas which are in critical need of development to meet projected space mission requirements; (4) scope a program for the coordinated development of the required technology. E.A.K.

N85-13856*# European Space Agency, Paris (France).
EUROPEAN DEVELOPMENT EXPERIENCE ON ENERGY STORAGE WHEELS FOR SPACE c44
A. A. Robinson *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 65-73 ref (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

High speed fiber composite rotors suspended by contactless magnetic bearings were produced. European industry has acquired expertise in the study and fabrication of energy storage wheels and magnetic suspension systems for space. Sufficient energy density performance for space viability is being achieved on fully representative hardware. Stress cycle testing to demonstrate life capability and the development of burst containment structures remains to be done and is the next logical step. E.A.K.

N85-13857*# Boeing Aerospace Co., Seattle, Wash.
MERITS OF FLYWHEELS FOR SPACECRAFT ENERGY STORAGE
Sidney Gross *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 75-89 refs (For primary document see N85-13850 05-20)
(Contract NAS9-16151)
Avail: NTIS HC A18/MF A01 CSCL 10B

Flywheel energy storage systems which have a very good potential for use in spacecraft are discussed. This system can be superior to alkaline secondary batteries and regenerable fuel cells in most of the areas that are important in spacecraft applications. Of special importance, relative to batteries, are lighter weight, longer cycle and operating life, and high efficiency which minimizes solar array size and the amount of orbital makeup fuel required. Flywheel systems have a long shelf life, give a precise state of charge indication, have modest thermal control needs, are capable of multiple discharges per orbit, have simple ground handling needs, and have characteristics which would be useful for military applications. The major disadvantages of flywheel energy storage systems are that: power is not available during the launch phase without special provisions; and in flight failure of units may force shutdown of good counter rotating units, amplifying the effects of failure and limiting power distribution system options; no inherent emergency power capability unless specifically designed for, and a high level of complexity compared with batteries. The potential advantages of the flywheel energy storage system far outweigh the disadvantages. E.A.K.

N85-13858*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMPARATIVE ENERGY STORAGE ASSESSMENT ITEM c44
Bob Giudici *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 91-99 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

This analysis, a Space Station application study, rediscovered Integrated Power and Attitude Control (IPAC) and found the approach to have lower initial and resupply weight and lower initial and resupply cost than either battery/CMG or regenerative fuel cell/CMG systems. Preliminary trade studies were performed comparing (IPAC) with equivalent independent electrochemical power and control moment gyro (CMG) control approaches. Technologies considered to have adequate status for an initial Space Station were: (1) nickel cadmium batteries (NiCd batteries), (2) regenerative fuel cells (RFC), (3) Skylab class CMG's, and (4) state of the art IPAC using metal wheels and ball bearing suspension (SOA-IPAC). An advanced IPAC (ADV-IPAC) employing composite rotor material and magnetic suspension was included in the comparisons to illustrate a possible range of performance and cost of inertial systems. The candidates were compared on the basis of initial weight and cost and on the basis of resupply weight and cost for a 15 year mission. Thus, SOA-IPAC would appear to be an attractive approach for the initial Space Station and possible technology improvements would further the appeal for the initial and/or growth Space Station. B.W.

N85-13859*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
INERTIAL STORAGE FOR SATELLITES
David Eisenhaure *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 101-116 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

A new system is being developed that performs satellite attitude control, attitude reference, and energy storage utilizing inertia wheels. The baseline approach consists of two counter rotating flywheels suspended in specially designed magnetic bearings, spin axis motor/generators, and a control system. The control system regulates the magnetic bearings and spin axis motor/generators and interacts with other satellite subsystems (photovoltaic array, star trackers, Sun sensors, magnetic torquers, etc.) to perform the three functions. Existing satellites utilize separate subsystems to perform attitude control, provide attitude reference, and store energy. These functions are currently performed using reaction or momentum wheels, gyros, batteries, and devices that provide an absolute reference (Sun sensors and star trackers). A Combined Attitude, Reference, and Energy Storage (CARES) system based on high energy density inertial energy storage wheels (flywheels) has potential advantages over existing technologies. Even when used only for energy storage, this system offers the potential for substantial improvements in life, energy efficiency, and weight over existing battery technologies. Utilizing this same device for both attitude control and attitude reference would result in significant additional savings in overall satellite weight and complexity. Author

N85-13860*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
PERSPECTIVES ON ENERGY STORAGE WHEELS FOR SPACE STATION APPLICATION
Ronald E. Oglevie *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 117-127 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

Several of the issues of the workshop are addressed from the perspective of a potential Space Station developer and energy wheel user. Systems' considerations are emphasized rather than component technology. The potential of energy storage wheel (ESW) concept is discussed. The current status of the technology base is described. Justification for advanced technology development is also discussed. The study concludes that energy storage in wheels is an attractive concept for immediate technology development and future Space Station application. B.W.

N85-13861*# Wisconsin Univ., Madison. Dept. of Medical Physics.
FLYWHEEL-POWERED X-RAY GENERATOR c44
Melvin P. Siedband *In* NASA. Langley Research Center An

Assessment of Integrated Flywheel System Technol. Nov. 1984 p 129-139 refs (For primary document see N85-13850 05-20) (Contract DAMD17-82-C-2050)
Avail: NTIS HC A18/MF A01 CSCL 10B

The use of a small flywheel appears to be a practical alternative to other power sources for mobile X-ray system applications. A 5 kg flywheel has been constructed which runs at 10 krpm and stores 30 KJ while requiring less than 500 W to bring the system up to speed. The wheel is coupled to an aircraft alternator and can yield pulsed power levels over 50 KWp. The aircraft alternator has the advantage of high frequency output which has also permitted the design of smaller high voltage transformers. A series of optical sensors detecting shaft position function as an electronic commutator so that the alternator may operate as a motor to bring the wheel up to operating speed. The system permits the generation of extremely powerful X-rays from a variety of low power sources such as household power outlets, automobile batteries or sources of poorly regulated electrical power such as those found in third world countries. Author

N85-13862*# Westinghouse Research and Development Center, Pittsburgh, Pa.
WESTINGHOUSE PROGRAMS IN PULSED HOMOPOLAR POWER SUPPLIES **c44**
D. C. Litz and E. Mullan *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 141-156 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

This document details Westinghouse's ongoing study of homopolar machines since 1929 with the major effort occurring in the early 1970's to the present. The effort has enabled Westinghouse to develop expertise in the technology required for the design, fabrication and testing of such machines. This includes electrical design, electromagnetic analysis, current collection, mechanical design, advanced cooling, stress analysis, transient rotor performance, bearing analysis and seal technology. Westinghouse is using this capability to explore the use of homopolar machines as pulsed power supplies for future systems in both military and commercial applications. B.W.

N85-13863*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESCRIPTION OF A LABORATORY MODEL ANNULAR MOMENTUM CONTROL DEVICE (AMCD)
Nelson J. Groom *In its* An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 157-167 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The basic concept of the Annular Momentum Control Device (AMCD) is that of a rotating annular rim suspended by noncontacting magnetic bearings and driven by a noncontacting electromagnetic spin motor. The purpose of this paper is to highlight some of the design requirements for AMCD's in general and describe how these requirements were met in the implementation of laboratory test model AMCD. An AMCD background summary is presented. B.W.

N85-13864*# Steele (R. S.), Greenville, S.C.
GENERIC COMPOSITE FLYWHEEL DESIGNS **c24**
R. S. Steele *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 169-179 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 11D

Fiber reinforced composites belong to a new class of materials and allow great flexibility in flywheel design. The most efficient flywheel may no longer have the classic Stodola taper and indeed, may not even be round. Some of the flywheel designs that have been developed in the past are discussed. Although choice of material, mounts and service requirements often dictate the final design choice for a particular application, the composite flywheels in this paper are classified within a geometric framework, a simple stress analysis of a circular disk is carried out. B.W.

N85-13865*# Oak Ridge National Lab., Tenn.
SUMMARY RESULTS OF THE DOE FLYWHEEL DEVELOPMENT EFFORT **c44**
M. Olszewski and J. F. Martin *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 181-191 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The technology and applications evaluation task focuses on defining performance and cost requirements for flywheels in the various areas of application. To date the DOE program has focused on automotive applications. The composite materials effort entails the testing of new commercial composites to determine their engineering properties. The rotor and containment development work uses data from these program elements to design and fabricate flywheels. The flywheels are then tested at the Oak Ridge Flywheel Evaluation Laboratory and their performance is evaluated to indicate possible areas for improvement. Once a rotor has been fully developed it is transferred to the private sector. R.S.F.

N85-13866*# Lord Corp., Erie, Pa.
FLEXIBLE MATRIX COMPOSITE LAMINATED DISK/RING FLYWHEEL **c24**
B. P. Gupta and A. J. Hannibal *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 193-207 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 11D

An energy storage flywheel consisting of a quasi-isotropic composite disk overwrapped by a circumferentially wound ring made of carbon fiber and a elastometric matrix is proposed. Through analysis it was demonstrated that with an elastomeric matrix to relieve the radial stresses, a laminated disk/ring flywheel can be designed to store a least 80.3 Wh/kg or about 68% more than previous disk/ring designs. at the same time the simple construction is preserved. Author

N85-13867*# General Electric Co., Philadelphia, Pa. Space Systems Div.
GENERAL ELECTRIC COMPOSITE RING-DISK FLYWHEEL: RECENT AND POTENTIAL DEVELOPMENTS **c24**
Anthony P. Coppa *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 209-231 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 11D

Recent developments of the General Electric hybrid rotor design are described. The relation of the hybrid rotor design to flywheel designs that are especially suitable for spacecraft applications is discussed. Potential performance gains that can be achieved in such rotor designs by applying latest developments in materials, processing, and design methodology are projected. Indications are that substantial improvements can be obtained. R.S.F.

N85-13868*# Rocketdyne, Canoga Park, Calif.
THE MULTIPURPOSE COMPOSITE FLYWHEEL **c44**
B. R. Ginsburg *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 233-242 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The twin disk composite flywheel shows that the techniques that were developed at Rocketdyne to successfully design, fabricate, and test high-speed rotating machinery (turbopumps) for rocket engines could be used to develop advanced flywheels. This flywheel not only demonstrates that successful mating of metal flywheel characteristics (high torque and ruggedness) and composite flywheel characteristics (lightweight and high energy density) can be achieved, but the unique design lends itself to easy adaptation to other configurations. R.S.F.

N85-13869*# General Electric Co., Philadelphia, Pa. Space Systems Div.
FLYWHEEL CONTAINMENT AND SAFETY CONSIDERATIONS

c31

Anthony P. Coppa *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 243-264 refs Sponsored in part by DOE (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 13B

Flywheel safety and containment design technology are discussed. The effects of axial loading resulting from composite rotor burst tests are considered. Analysis of the radial burst problem is also included. R.S.F.

N85-13870*# Sperry Flight Systems, Phoenix, Ariz.
MAGNETICALLY SUSPENDED REACTION WHEEL ASSEMBLY c44

George Stocking *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 265-279 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The magnetically suspended reaction wheel assembly (MSRWA) is the product of a development effort funded by the Air Force Materials Laboratory (AFML) at Wright Patterson AFB. The specific objective of the project was to establish the manufacturing processes for samarium cobalt magnets and demonstrate their use in a space application. The development was successful on both counts. The application portion of the program, which involves the magnetically suspended reaction wheel assembly, is emphasized. The requirements for the reaction wheel were based on the bias wheel requirements of the DSP satellite. The tasks included the design, fabrication, and test of the unit to the DSP program qualification requirements. R.S.F.

N85-13871*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
MAGNETIC SUSPENSION OPTIONS FOR SPACECRAFT INERTIA-WHEEL APPLICATIONS
J. R. Downer *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 281-296 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

Design criteria for spacecraft inertia-wheel suspensions are listed. The advantages of magnetic suspensions over other suspension types for spacecraft inertia-wheel applications are cited along with the functions performed by magnetic suspension. The common designs for magnetic suspensions are enumerated. Materials selection of permanent magnets and core materials is considered. R.S.F.

N85-13872*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OVERVIEW OF MAGNETIC BEARING CONTROL AND LINEARIZATION APPROACHES FOR ANNULAR MAGNETICALLY SUSPENDED DEVICES
Nelson J. Groom *In its* An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 297-306 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

An overview of magnetic bearing control and linearization approaches which have been considered for annular magnetically suspended devices is presented. These devices include the Annular Momentum Control Device and the Annular Suspension and Pointing System. Two approaches were investigated for controlling the magnetic actuator. One approach involves controlling the upper and lower electromagnets differentially about a bias flux. The bias flux can either be supplied by permanent magnets in the magnetic circuit or by bias currents. In the other approach, either the upper electromagnet or the lower electromagnet is controlled depending on the direction of force required. One advantage of the bias flux is that for small gap perturbations about a fixed operating point, the force-current characteristic is linear. Linearization approaches investigated for individual element control include an analog solution of the nonlinear electromagnet force equation and a microprocessor-based table lookup method. M.G.

N85-13873*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETICALLY SUSPENDED FLYWHEEL SYSTEM STUDY
J. A. Kirk (Maryland Univ., College Park), D. K. Anand (Maryland Univ., College Park), H. E. Evans (Advanced Technology and Research, Inc., Burtonsville, Md.), and G. E. Rodriguez *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 307-328 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

A program to study the application of a graphite/epoxy, magnetically suspended, pierced disk flywheel for the combined function of spacecraft attitude control and energy storage (ACES) is described. Past achievements of the program include design and analysis computer codes for the flywheel rotor, a magnetically suspended flywheel model, and graphite/epoxy rotor rings that were successfully prestressed via interference assembly. All hardware successfully demonstrated operation of the necessary subsystems which form a complete ACES design. Areas of future work include additional rotor design research, system definition and control strategies, prototype development, and design/construction of a UM/GSFC spin test facility. The results of applying design and analysis computer codes to a magnetically suspended interference assembled rotor show specific energy densities of 42 Wh/lb (92.4 Wh/kg) are obtained for a 1.6 kWh system. M.G.

N85-13874*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REACTION WHEELS FOR KINETIC ENERGY STORAGE c44
Philip A. Studer *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 329-340 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

In contrast to all existing reaction wheel implementations, an order of magnitude increase in speed can be obtained efficiently if power to the actuators can be recovered. This allows a combined attitude control-energy storage system to be developed with structure mounted reaction wheels. The feasibility of combining reaction wheels with energy storage wwheels is demonstrated. The power required for control torques is a function of wheel speed but this energy is not dissipated; it is stored in the wheel. The I(2)R loss resulting from a given torque is shown to be constant, independent of the design speed of the motor. What remains, in order to efficiently use high speed wheels (essential for energy storage) for control purposes, is to reduce rotational losses to acceptable levels. Progress was made in permanent magnet motor design for high speed operation. Variable field motors offer more control flexibility and efficiency over a broader speed range. M.G.

N85-13875*# Sperry Flight Systems, Phoenix, Ariz.
ADVANCED HIGH-POWER TRANSFER THROUGH ROTARY INTERFACES c44
Pete Jacobson *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 341-348 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

A roll-ring design that is uniquely suited for rotary signal/power transfer in space applications is described. Two high-power configurations of the roll ring were developed. Present lab-proven hardware is available with power transfer capability of 2 kW at 200 amps and higher power units with 100-kW capability are in the design stage. Theoretical analysis indicated that power levels of > kW are possible. M.G.

N85-13876*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
HIGH-EFFICIENCY POWER CONVERSION OPTIONS FOR FLYWHEEL ENERGY STORAGE SYSTEMS c44
R. L. Hockney *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 349-367 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

The impact of efficiency on the power system and how efficiency is affected by component types is discussed. Some ac

and dc bus configurations are described along with prototype systems. M.G.

N85-13877*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENTS IN SPACE POWER COMPONENTS FOR POWER MANAGEMENT AND DISTRIBUTION
David D. Renz *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 369-387 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

Advanced power electronic components development for space applications is discussed. The components described include transformers, inductors, semiconductor devices such as transistors and diodes, remote power controllers, and transmission lines.M.G.

N85-13878*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MOTOR/GENERATOR AND ELECTRONIC CONTROL CONSIDERATIONS FOR ENERGY STORAGE FLYWHEELS c33
Frank Nola *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 389-406 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 09C

A spacecraft electric power supply system is described. Requirements of the system are to accelerate a momentum wheel to a fixed maximum speed when solar energy is available and to maintain a constant voltage on the spacecraft bus under varying loads when solar energy is not available. Candidate motor types, pulse width modulated current control systems, and efficiency considerations are discussed. In addition, the Lunar Roving Vehicle motors are described along with their respective efficiencies. M.G.

N85-13879*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TORQUE COMMAND STEERING LAW FOR DOUBLE-GIMBALED CONTROL MOMENT GYROS APPLIED TO ROTOR ENERGY STORAGE c44
Hans F. Kennel *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 407-422 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

A steering law is presented which has all the features required for space applications, assuming the CMG outer gimbal freedom is unlimited. The reason is the idea of mounting all the outer gimbal axes of the CMGs parallel to each other. This allows the decomposition of the steering law problem into a linear one for the inner gimbal angle rates and a planar one for the outer gimbal angle rates. The inner gimbal angle rates are calculated first, since they are not affected by the outer gimbal angle rates. For the calculation of the outer rates, the inner rates are then known quantities. An outer gimbal angle distribution function (to avoid singularities internal to the total angular momentum envelope) generates distribution rates next, and finally the pseudoinverse method is used to insure that the desired total torque is delivered. M.G.

N85-13880*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE POWER
Washington Apr. 1984 322 p refs Workshop held in Cleveland, 10-12 Apr. 1984
(NASA-CP-2352; E-2305; NAS 1.55:2352) Avail: NTIS HC A14/MF A01 CSCL 22B

Appropriate directions for the applied research and technology programs that will develop space power systems for U.S. future space missions beyond 1995 are explored. Spacecraft power supplies; space stations, space power reactors, solar arrays, thermoelectric generators, energy storage, and communication satellites are among the topics discussed. For individual titles, see N85-13881 through N85-13909.

N85-13881*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATION POWER SYSTEM
C. R. Baraona *In* NASA. Lewis Research Center Space Power Apr. 1984 p 7-14 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01

The strategies, reasoning, and planning guidelines used in the development of the United States Space Station Program are outlined. The power required to support Space Station missions and housekeeping loads is a key driver in overall Space Station design. conversely, Space Station requirements drive the power technology. Various power system technology options are discussed. The mission analysis studies resulting in the required Space Station capabilities are also discussed. An example of Space Station functions and a concept to provide them is presented. The weight, area, payload and altitude requirements on draft and mass requirements are described with a summary and status of key power systems technology requirements and issues. R.J.F.

N85-13882*# Air Force Space Technology Center, Kirtland AFB, N. Mex.
EMERGING SPACE NUCLEAR POWER NEEDS
Frank J. Redd and Efren V. Fornoles *In* NASA. Lewis Research Center Space power Apr. 1984 p 27-30 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Growing interest in new classes of military and civil space systems which demand substantial increases in power over current satellites is generating a renewed interest in space qualified nuclear power systems. Indeed, one can say that power is a limiting technology to the achievement of many future goals in space. The speed of nuclear power system development is currently limited by the lack of a clear distinct definition of system requirements. Emerging system requirements are discussed for the following fields: robust surveillance systems, survivable communication systems with anti-jam capabilities, electric propulsion systems, and weapons applications. R.J.F.

N85-13883*# RCA Government Systems Div., Moorestown, N. J.
SPACE POWER FOR COMMUNICATION SATELLITES BEYOND 1995
P. R. Pierce *In* NASA. Lewis Research Center Space Power Apr. 1984 p 31-36 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The space power trends for communication satellites beginning in the mid-70's are reviewed. Predictions of technology advancements and requirements were compared with actual growth patterns. The conclusions derived suggest that the spacecraft power system technology base and present rate of advancement will not be able to meet the power demands of the early to mid-90's. It is recommended that an emphasis on accelerating the technology development be made to minimize the technology gap. R.J.F.

N85-13884*# Little (Arthur D.), Inc., Cambridge, Mass.
POWER FOR COMMERCIAL SPACE APPLICATIONS
Philip K. Chapman *In* NASA. Lewis Research Center Space Power Apr. 1984 p 37-44 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Since the proposed space station is intended to be a permanent installation, used in part by commercial organizations, its design requirements differ fundamentally from those in previous manned spacecraft. In particular, commercialization on a significant scale depends critically on the ability to control capital and operational costs, including the cost of energy, and this demands new approaches to systems such as the power supply for the space station. These considerations suggest guidelines for power plant development. The cost of energy in space, guidelines for power supply development, quality standards, and the role of government are discussed. R.J.F.

N85-13885*# ECON, Inc., Princeton, N. J.
EVALUATING NASA TECHNOLOGY PROGRAMS IN TERMS OF PRIVATE SECTOR IMPACTS c12
Joel S. Greenberg *In* NASA. Lewis Research Center Space Power Apr. 1984 p 45-50 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 22A

NASA is currently developing spacecraft technology for application to NASA scientific missions, military missions and commercial missions which are part of or form the basis of private sector business ventures. The justification of R&D programs that lead to spacecraft technology improvements encompasses the establishment of the benefits in terms of improved scientific knowledge that may result from new and/or improved NASA science missions, improved cost effectiveness of NASA and DOD missions and new or improved services that may be offered by the private sector (for example communications satellite services). It is with the latter of these areas that attention will be focused upon. In particular, it is of interest to establish the economic value of spacecraft technology improvements to private sector communications satellite business ventures. It is proposed to assess the value of spacecraft technology improvements in terms of the changes in cash flow and present value of cash flows, that may result from the use of new and/or improved spacecraft technology for specific types of private sector communications satellite missions (for example domestic point-to-point communication or direct broadcasting). To accomplish this it is necessary to place the new and/or improved technology within typical business scenarios and estimate the impacts of technical performance upon business and financial performance. R.J.F.

N85-13886*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MISSIONS/PLANNING PANEL c12
J. Stuart Fordyce *In its* Space Power Apr. 1984 p 57 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 22A

A panel discussion was held to develop a viewpoint of space power technology needs and state of readiness for future mission scenarios. Among the points made in the discussion, it was agreed that missions, particularly the far term ones, do serve to drive technology; however, as the missions become nearer term, issues of schedule and cost severely limit the willingness to accept risk. There are, in fact, no rewards to a mission manager for introducing new technology. Mission downscaling is the usual response to technology limitations. All panelists agreed that there exists a serious gap between when technologists feel their job is done and what mission managers need for decision. Typically a two to three year engineering development gap exists. It is essential to take technologies to the engineering model level and conduct a flight demonstration to close this gap. All agreed that increased effort should be made to achieve stronger interactions between planners and technologists and that workshops like the present one are a step in the right direction. Technologists need mission credibility and vice versa. R.J.F.

N85-13887*# Department of Energy, Washington, D. C.
RADIOISOTOPE SPACE POWER PROGRAMS c72
Bernard J. Rock *In* NASA. Lewis Research Center Space Power Apr. 1984 p 75-84 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 18L

Radioisotope Thermoelectric Generators (RTGs) were extensively used in past space missions with great success. An improved generation of RTGs employing a new lightweight, modular heat source is being built by the DOE for NASA launches in 1986. More advanced modular RTGs which promise power-to-weight ratios of over 8.8 watts(e)/kg (4 watts(e)/lb) are currently under development by the DOE and could be flight-ready within five years. Dynamic Isotope Power Systems (DIPS) which offer 18-20% conversion efficiencies were demonstrated by the DOE in ground tests. DIPS would be useful for several military missions requiring power in the low-kilowatt range. These systems could also be brought to flight readiness by the DOE following receipt of firm user requirements. R.J.F.

N85-13888*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRENDS IN SPACE PHOTOVOLTAIC TECHNOLOGY c44
John A. Scott-Monck *In* NASA. Lewis Research Center Space Power Apr. 1984 p 85-93 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The current status of silicon and gallium arsenide (GaAs) solar cell technology is described, and anticipated near and far term projections of photovoltaic cell performance are provided. It is shown that current ultrathin silicon and near term GaAs solar cells provide substantial enhancement of planar solar array performance. The advantages of utililizing GaAs cells in high concentration arrays is discussed. Evidence is provided to support the view that photovoltaic offers a viable means of supporting long term space objectives. R.J.F.

N85-13889*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTROCHEMISTRY AND STORAGE c25
Lawrence H. Thaller *In its* Space Power Apr. 1984 p 95-99 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 07D

The term electrochemistry implies the use of devices that convert chemical energy into electrical energy and sometimes vice versa. These devices are usually composed of some number of individual cells that are connected together to form a battery. In the cases where these devices cannot be electrically recharged they are usually referred to as primary batteries, whereas if these batteries can be charged and recharged repeatedly, they are called secondary batteries. The past and present uses of primary and secondary batteries in aerospace applications are discussed. R.J.F.

N85-13890*# Boeing Aerospace Co., Seattle, Wash.
POTENTIAL OF FLYWHEELS FOR SPACECRAFT ENERGY STORAGE c44
Sidney Gross *In* NASA. Lewis Research Center Space Power Apr. 1984 p 101-113 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10C

The use of flywheel systems for energy storage in spacecraft is considered. Energy density, efficiency, weight, voltage range, life, and reliability of flywheel systems are discussed. R.S.F.

N85-13891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRENDS IN CONCENTRATOR, RECEIVER, AND STORAGE DEVELOPMENT FOR TERRESTRIAL APPLICATIONS c44
E. John Roschke, William A. Owen, Wesley A. Menard, and Toshio Fujita *In* NASA. Lewis Research Center Space Power Apr. 1984 p 115-135 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The experience gained and the technical trends of the DOE-sponsored terrestrial solar thermal power systems project are summarized with respect to concentrator and receiver/storage development. Relevance of this experience to space power applications, and the perceived critical barriers of this technology, are discussed. It is concluded that, despite different objectives, the terrestrial program provides a strong basis of expertise valuable to space power applications development. Author

N85-13892*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC POWER SYSTEMS FOR POWER GENERATION c44
Robert E. English *In its* Space Power Apr. 1984 p 137-149 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The characteristics of dynamic power systems have considerable potential value, especially for the space station. The base of

technology that makes these dynamic power systems practical is reviewed. The following types of power-generating systems are examined herein: organic Rankine cycle, potassium Rankine cycle, Brayton cycle, and Stirling cycle. R.S.F.

N85-13893*# GA Technologies, Inc., San Diego, Calif.
TECHNOLOGY STATUS OF THERMIONIC FUEL ELEMENTS FOR SPACE NUCLEAR POWER **c73**
J. W. Holland and L. Yang *In* NASA. Lewis Research Center Space Power Apr. 1984 p 157-169 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 18K

Thermionic reactor power systems are discussed with respect to their suitability for space missions. The technology status of thermionic emitters and sheath insulator assemblies is described along with testing of the thermionic fuel elements. R.S.F.

N85-13894*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH TEMPERATURE THERMOELECTRIC ENERGY CONVERSION **c44**
Charles Wood *In* NASA. Lewis Research Center Space Power Apr. 1984 p 171-187 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The electronic and thermal transport properties of the most promising material systems for high temperature thermoelectric energy conversion are discussed from a theoretical and experimental viewpoint. Rare earth chalcogenides and boron-rich borides are considered in terms of thermal conductivity and transport mechanisms. Rare earth chalcogenides are generally n-type semiconductors and boron-rich borides are generally p-type semiconductors. R.S.F.

N85-13895*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THERMAL MANAGEMENT TECHNOLOGY STATUS **c34**
Richard C. Parish *In* NASA. Lewis Research Center Space Power Apr. 1984 p 189-203 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 20D

The thermal control requirements of a large space station are considered. Motivations for advanced thermal technology are discussed. Two test programs, designed to evaluate the analytical and theoretical basis from which thermal technology directions are determined, are described. R.S.F.

N85-13896*# TRW, Inc., Redondo Beach, Calif.
SPACE POWER MANAGEMENT AND DISTRIBUTION STATUS AND TRENDS
George M. Reppucci, John J. Biess, and Leonard Inouye *In* NASA. Lewis Research Center Space Power Apr. 1984 p 205-218 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

An overview of space power management and distribution (PMAD) is provided which encompasses historical and current technology trends. The PMAD components discussed include power source control, energy storage control, and load power processing electronic equipment. The status of distribution equipment comprised of rotary joints and power switchgear is evaluated based on power level trends in the public, military, and commercial sectors. Component level technology thrusts, as driven by perceived system level trends, are compared to technology status of piece-parts such as power semiconductors, capacitors, and magnetics to determine critical barriers. R.S.F.

N85-13897*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYTICAL MODELING OF SPACECRAFT POWER SYSTEMS
Floyd E. Ford *In* NASA. Lewis Research Center Space Power Apr. 1984 p 219-223 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

During the 25 years of space flight with unmanned Earth orbiting satellites, there has been an evolution of power systems in three general areas. The size of power system in terms of power demand at the bus has increased from a few watts in the early 1960s to a few hundred watts during the 1970s. Today, the bus power requirements are typically in the .5 to 1 kw range with some mission requirements exceeding the 1 kw size. Power grounding and user isolation are major design considerations when high fidelity power is required by a user. R.S.F.

N85-13898*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF THE SOLAR AND EXTRATERRESTRIAL ENVIRONMENTS ON SPACE POWER SYSTEMS
Henry Berry Garrett and Guy Spitale *In* NASA. Lewis Research Center Space Power Apr. 1984 p 225-249 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Environments surrounding the major extraterrestrial bodies in the solar system and their interactions with spacecraft power systems are summarized. The environments associated with neutrals/dust, low energy plasma, and where applicable, magnetospheres are discussed for a wide variety of cases. The impact of these environments on power systems - in particular, radiation effects, spacecraft charging, plasma interactions, surface sputtering/erosion, and induced currents - are presented. As power systems must be designed to survive in these hostile environments, it is important that they be taken into account in planning future power systems. Author

N85-13899*# Washington Univ., Seattle.
ADVANCED CONCEPTS LIQUID DROPLET RADIATOR
A. Hertzberg *In* NASA. Lewis Research Center Space Power Apr. 1984 p 251-260 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

An exploratory point design study was carried out on a shuttle-launchable megawatt nuclear orbit transfer vehicle (OTV) with a 5000 kg payload capacity. The system, which consists of a fixed bed reactor, a Brayton cycle power conversion system, and a liquid droplet radiator (LDR) to reject heat, is deployable from a small package. The methods and technologies of this design are discussed, as well as critical design problems. While this is a preliminary study, it indicates that a space-nuclear reactor, combined with the LDR, make possible a continuous 10 MW(e) power station on orbit with a single shuttle launch. M.G.

N85-13900*# Washington Univ., Seattle.
THE LIQUID DROPLET RADIATOR - AN ULTRALIGHTWEIGHT HEAT REJECTION SYSTEM FOR EFFICIENT ENERGY CONVERSION IN SPACE
A. T. Mattick and A. Hertzberg *In* NASA. Lewis Research Center Space Power Apr. 1984 p 261-274 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

A heat rejection system for space is described which uses a recirculating free stream of liquid droplets in place of a solid surface to radiate waste heat. By using sufficiently small droplets (< 100 micron diameter) of low vapor pressure liquids the radiating droplet sheet can be made many times lighter than the lightest solid surface radiators (heat pipes). The liquid droplet radiator (LDR) is less vulnerable to damage by micrometeoroids than solid surface radiators, and may be transported into space far more efficiently. Analyses are presented of LDR applications in thermal and photovoltaic energy conversion which indicate that fluid handling components (droplet generator, droplet collector, heat exchanger, and pump) may comprise most of the radiator system mass. Even the unoptimized models employed yield LDR system masses less than heat pipe radiator system masses, and significant improvement is expected using design approaches that incorporate fluid handling components more efficiently. Technical problems (e.g., spacecraft contamination and electrostatic deflection of droplets)

unique to this method of heat rejectioon are discussed and solutions are suggested. M.G.

N85-13901*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ELECTRODYNAMIC TETHERS. 1: POWER GENERATOR IN LEO. 2: THRUST FOR PROPULSION AND POWER STORAGE
James E. McCoy *In* NASA. Lewis Research Center Space Power Apr. 1984 p 275-284 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

An electrodynamic tether consists of a long insulated wire in space whose orbital motion cuts across lines of magnetic flux to produce an induce voltage that in typical low orbits averages about 200 v/km. Such a system should be capable of generating substantial electrical power, at the expense of IXB drag acting on its orbital energy. If a reverse current is driven against the induced voltage, the system should act as a motor producing IXB thrust. A reference system was designed, capable of generating 20 KW of power into an electrical load located anywhere along the wire at the expense of 2.6N (20,000 J/sec) drag on the wire. In an ideal system, the conversion between mechanical and electrical energy would reach 100% efficiency. In the actual system part of the 20 KW is lost to internal resistance of the wire, plasma and ionosphere, while the drag force is increased by residual air drag. The 20 KW PMG system as designed is estimated to provide 18.7 KW net power to the load at total drag loss of 20.4 KJ/sec, or an overall efficiency of 92%. Similar systems using heavier wire appear capable of producing power levels in excess of 1 Megawatt at voltages of 2-4 KV, with conversion efficiency between mechanical and electrical power better than 95%. The hollow cathode based system should be readily reversible from generator to motor operation by driving a reverse current using onboard power. M.G.

N85-13902*# Lockheed Missiles and Space Co., Palo Alto, Calif.
PHOTOVOLTAIC WORKING GROUP REPORT c44
Larry G. Chidester and Joseph F. Wise (Wright-Patterson AFB, Ohio) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 285-291 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Results of the photovoltaic subcommittee meeting are summarized. The specific topics addressed include solar cell development and efficiency evaluation, concentrator arrays and array structural technology, and environmental interaction problems. M.G.

N85-13903*# United Technologies Corp., East Hartford, Conn.
ELECTROCHEMISTRY AND STORAGE PANEL REPORT c25
J. K. Stedman and G. Halpert (JPL) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 293-296 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Design and performance requirements for electrochemical power storage systems are discussed and some of the approaches towards satisfying these constraints are described. Geosynchronous and low Earth orbit applications, radar type load constraints, and high voltage systems requirements are addressed. In addition, flywheel energy storage is discussed. M.G.

N85-13904*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DYNAMIC CONVERSION WORKING GROUP SUMMARY
Norman Chaffee and Ronald J. Sovie (NASA. Lewis Research Center, Cleveland, Ohio) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 297-299 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The potential of dynamic conversion devices for use in solar and nuclear dynamic space power systems was addressed. Conversion systems considered were based on the use of Brayton, Stirling and Rankine cycles. Both organic and liquid metal Rankine cycles were included. The basic system considerations were: mission requirements, system attributes, system options, technology issues and constraints, and priorities of needed technology development. Mission requirements, where dynamic conversion was considered enabling technology, were indentified along with the associated power levels and potential energy sources. When considering the system options special attention was given to recommend operating temperatures and other significant discriminators. A list of prioritized tasks considered important for the successful development of dynamic conversion systems for 1995 and beyond was compiled. M.G.

N85-13905*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMOELECTRIC AND THERMIONIC CONVERSION TECHNOLOGY
Jack F. Mondt and Judith H. Ambrus (NASA, Washington, D.C.) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 301-307 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Applied research and technology efforts in thermoelectric and thermionic programs were recommended that will enable space power systems for the nation's future space missions. Specifically it was argued that the effort in thermoelectric materials technology be broadened with the objective of obtaining a material with a Figure of Merit greater than 1.0 x 10(-3)/K for hot junction temperatures of 1100 to 1500 K. The recommended effort in thermionics is to pursue technology programs that will result in an understanding and lifetime prediction methodologies for fuel-emitter and sheath-insulator behavior as a function of operating time and temperature. Also it is recommended that an effort be initiated that combines the thermoelectric, thermionic and power electronic technologies into a program to develop the technology for high temperature, high radiation resistant, and high current electronic switches. M.G.

N85-13906*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEAT REJECTION WORKING GROUP SYNOPSIS
Richard C. Parish and Robert Haslett (Grumman Aerospace Corp.) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 309-316 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Heat rejection system requirements of specific mission types (space station, planetary exploration, commercial, very high power, and military missions) are discussed. Heat pipe radiators, weight and volume reduction, stable coatings, and working fluids are addressed. M.G.

N85-13907*# Boeing Aerospace Co., Seattle, Wash.
ELECTRICAL SYSTEM TECHNOLOGY WORKING GROUP (WG) REPORT
Sidney Silverman and Floyd E. Ford (NASA. Goddard Space Flight Center, Greenbelt, Md.) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 317-321 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

The technology needs for space power systems (military, public, commercial) were assessed for the period 1995 to 2005 in the area of power management and distribution, components, circuits, subsystems, controls and autonomy, modeling and simulation. There was general agreement that the military requirements for pulse power would be the dominant factor in the growth of power systems. However, the growth of conventional power to the 100 to 250kw range would be in the public sector, with low Earth orbit needs being the driver toward large 100kw systems. An overall philosophy for large power system development is also described. M.G.

N85-13908*# Hughes Aircraft Co., Canoga Park, Calif.
ENVIRONMENTAL INTERACTIONS WORKING GROUP REPORT
N. John Stevens and Michael Wiskerchen (NASA, Washington, D.C.) *In* NASA. Lewis Research Center Space Power Apr.

1984 p 323-326 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Interactions between spacecraft systems and the space charged particle environment are reviewed and recommendations are presented for both near-term and far-term research considerations. Transient environment models, large space structures, solar and nuclear power systems/environment interactions, single event upsets, material degradation, and planetary missions are addressed. M.G.

N85-13909*# Washington Univ., Seattle.
ADVANCED AND NONTRADITIONAL CONCEPTS WORKING GROUP REPORT
A. Hertzberg *In* NASA. Lewis Research Center Space Power Apr. 1984 p 327-335 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

Advanced and nontraditional concepts relating to future space power requirements were examined with special emphasis on the requirements for the space station. Key findings in the following ares are outlined: dynamic radiation concepts, space nuclear reactors, energy conversion cycles, beam power transmission, electrodynamic tethers and advanced photovoltaics. M.G.

N85-13910*# Cleveland State Univ., Ohio. Coll. of Engineering.
A HISTORICAL OVERVIEW OF THE ELECTRICAL POWER SYSTEMS IN THE US MANNED AND SOME US UNMANNED SPACECRAFT Final Report, Apr. 1984 - Jan. 1985
James E. Maisel Nov. 1984 158 p refs
(Grant NAG3-547)
(NASA-CR-174806; NAS 1.26:174806; MAI-R4) Avail: NTIS HC A08/MF A01 CSCL 22B

A historical overview of electrical power systems used in the U.S. manned spacecraft and some of the U.S. unmanned spacecraft is presented in this investigation. A time frame of approximately 25 years, the period for 1959 to 1984, is covered in this report. Results indicate that the nominal bus voltage was 28 volts dc in most spacecraft and all other voltage levels were derived from this voltage through such techniques as voltage inversion or rectification, or a combination. Most spacecraft used solar arrays for the main source of power except for those spacecraft that had a relatively short flight duration, or deep spaceprobes that were designed for very long flight duration. Fuel cells were used on Gemini, Apollo, and Space Shuttle (short duration flights) while radioisotope thermoelectric generators were employed on the Pioneer, Jupiter/Saturn, Viking Lander, and Voyager spacecraft (long duration flights). The main dc bus voltage was unregulated on the manned spacecraft with voltage regulation provided at the user loads. A combination of regulated, semiregulated, and unregulated buses were used on the unmanned spacecraft depending on the type of load. For example, scientific instruments were usually connected to regulated buses while fans, relays, etc. were energized from an unregulated bus. Different forms of voltage regulation, such as shunt, buck/boot, and pulse-width modulated regulators, were used. This report includes a comprehensive bibliography on spacecraft electrical power systems for the space programs investigated. Author

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N85-13911*# Wyoming Univ., Laramie. Composite Materials Research Group.
INVESTIGATION OF THE RELATIONS BETWEEN NEAT RESIN AND ADVANCED COMPOSITE MECHANICAL PROPERTIES. VOLUME 1: RESULTS Technical Report, May 1982 - May 1983
Richard S. Zimmerman, Donald F. Adams, and David E. Walrath Nov. 1984 263 p refs 2 Vol.
(Grant NAG1-277)
(NASA-CR-172303; NAS 1.26:172303;
UWME-DR-301-101-1-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 11D

A detailed evaluation of one untoughened epoxy baseline resin and three toughened epoxy resin systems was performed. The Hercules 3502, 2220-1, and 2220-3, and Ciba-Geigy Fibredux 914 resin systems were supplied in the uncured state by NASA-Langley and cast into thin flat specimens and round dogbone specimens. Tensile and torsional shear measurements were performed at three temperatures and two moisture conditions. Coefficients of thermal expansion and moisture expansion were also measured. Extensive scanning electron microscopic examination of fracture surfaces was performed, to permit the correlation of observed failure modes with the environmental conditions under which the various specimens were tested. A micromechanics analysis was used to predict the unidirectional composite response under the various test conditions, using the neat resin experimental results as the required input data. Mechanical and physical test results, the scanning electron microscope observations, and the analytical predictions were then correlated. Author

N85-13912*# Boeing Commercial Airplane Co., Seattle, Wash.
FULL-SCALE TESTING, PRODUCTION AND COST ANALYSIS DATA FOR THE ADVANCED COMPOSITE STABILIZER FOR BOEING 737 AIRCRAFT. VOLUME 1: TECHNICAL SUMMARY Final Report
R. B. Aniversario, S. T. Harvey, J. E. McCarty, J. T. Parsons, D. C. Peterson, L. D. Pritchett, D. R. Wilson, and E. R. Wogulis NASA Apr. 1983 32 p
(Contract NAS1-15025)
(NASA-CR-3649; NAS 1.26:3649; D6-46038-1-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 11D

The full scale ground test, ground vibration test, and flight tests conducted to demonstrate a composite structure stabilizer for the Boeing 737 aircraft and obtain FAA certification are described. Detail tools, assembly tools, and overall production are discussed. Cost analyses aspects covered include production costs, composite material usage factors, and cost comparisons. A.R.H.

N85-13913*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN, ANCILLARY TESTING, ANALYSIS AND FABRICATION DATA FOR THE ADVANCED COMPOSITE STABILIZER FOR BOEING 737 AIRCRAFT. VOLUME 1: TECHNICAL SUMMARY Final Report
R. B. Aniversario, S. T. Harvey, J. E. McCarty, J. T. Parsons, D. C. Peterson, L. D. Pritchett, D. R. Wilson, and E. R. Wogulis NASA Apr. 1983 59 p refs
(Contract NAS1-15025)
(NASA-CR-3648; NAS 1.26:3648; D6-46037-1-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 11D

The horizontal stabilizer of the 737 transport was redesigned. Five shipsets were fabricated using composite materials. Weight reduction greater than the 20% goal was achieved. Parts and assemblies were readily produced on production-type tooling. Quality assurance methods were demonstrated. Repair methods were developed and demonstrated. Strength and stiffness analytical methods were substantiated by comparison with test results. Cost data was accumulated in a semiproduction environment. FAA certification was obtained. A.R.H.

N85-13914*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN, ANCILLARY TESTING, ANALYSIS AND FABRICATION

DATA FOR THE ADVANCED COMPOSITE STABILIZER FOR BOEING 737 AIRCRAFT, VOLUME 2 Final Report
R. B. Aniversario, S. T. Harvey, J. E. McCarty, J. T. Parsons, D. C. Peterson, L. D. Pritchett, D. R. Wilson, and E. R. Wogulis Dec. 1982 400 p
(Contract NAS1-15025)
(NASA-CR-166011; NAS 1.26:166011; D6-46037-2-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 11D

Results of tests conducted to demonstrate that composite structures save weight, possess long term durability, and can be fabricated at costs competitive with conventional metal structures are presented with focus on the use of graphite-epoxy in the design of a stabilizer for the Boeing 737 aircraft. Component definition, materials evaluation, material design properties, and structural elements tests are discussed. Fabrication development, as well as structural repair and inspection are also examined.
A.R.H.

N85-13915*# Boeing Commercial Airplane Co., Seattle, Wash.
FULL-SCALE TESTING, PRODUCTION AND COST ANALYSIS DATA FOR THE ADVANCED COMPOSITE STABILIZER FOR BOEING 737 AIRCRAFT, VOLUME 2 Final Report
R. B. Aniversario, S. T. Harvey, J. E. McCarty, J. T. Parson, D. C. Peterson, L. D. Pritchett, D. R. Wilson, and E. R. Wogulis Dec. 1982 102 p refs
(Contract NAS1-15025)
(NASA-CR-166012; NAS 1.26:166012; D6-46038-2-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 11D

The development, testing, production activities, and associated costs that were required to produce five-and-one-half advanced-composite stabilizer shipsets for Boeing 737 aircraft are defined and discussed.
Author

N85-13916# GA Technologies, Inc., San Diego, Calif.
THERMAL CONTACT CONDUCTANCE MEASUREMENTS ON DOUBLET 3 ARMOR TITLE TRAPHITE
D. W. Doll and E. Reis Dec. 1983 6 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983 Submitted for publication
(Contract DE-AT03-76ET-51011)
(DE84-013554; GA-A-17199; CONF-831203-167) Avail: NTIS HC A02/MF A01

Several tests were performed on the Doublet III wall armor tiles to determine the cool-down rate and to evaluate improvements made by changing the conditions at the interface between the graphite tile and the stainless steel backing plate. Thermal diffusivity tests were performed in vacuum on both TiC coated and bare graphite tiles with and without 0.13 mm (.005") thick silver foil at the interface. The results of the armor tile cool-down tests showed improvement when a 0.13 mm (0.005") silver foil is used at the interface. At @.1 x 10(5) Pa (30 psi) contact pressure, the e-folding cool-down times for a TiC coated tile, bare graphite and bare graphite with a 0.06 mm (0.0035") silver shim were 10 min., 5.0 min., and 4.1 min., respectively. Tests using high contact pressures showed that the cool-down rates converged to approx. 4.0 min. At this limit, the conduction path along the backing plate to the two cooling tubes controls the heat flow, and no further improvement could be expected.
DOE

N85-13917# Ames Lab., Iowa.
X-RAY POLARIZATION IN HIGHLY ORIENTED PYROLYTIC GRAPHITE
W. J. Murphy 1 Aug. 1984 80 p refs
(Contract W-7405-eng-82)
(DE84-015573; IS-T-1151) Avail: NTIS HC A05/MF A01

An accurate method is given to select and verify a wavelength with a double monochromator. A method was developed which determines an internal zero for the UC OMEGA) circle and amount dependent zero for the phi circle. Results for the polarization effect from the HOPG (002) planes show that they behave like a perfect crystal.
DOE

N85-13918# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Betriebsnahe Ermuedungsfestigkeit.
MECHANICAL PROPERTIES OF ALIGNED SHORT CARBON FIBER REINFORCED PES AND PI LAMINATES
Karle Schulte, Gerd Horstenkamp (Ruhr Univ.), and Klaus Friedrich (Technische Universitaet, Hamburg, West Germany) Jun. 1984 101 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-898)
(DFVLR-FB-82-24) Avail: NTIS HC A06/MF A01; DFVLR, Cologne, DM, 35

The static and fatigue properties of fiber reinforced laminates with polyethersulphone and polyimide matrices were investigated. The resin matrices were reinforced with aligned short carbon fibers with a length of 3 mm. The investigations were performed at room temperature and at 100 C on the pure resin systems, the unidirectional laminates [0]8 and [90]8 as well as on [0, 90, 0, 90]s and [0, plus or minus 45, 0]s laminates. Damage development and damage mechanisms were examined. It is found that aligned short carbon fiber reinforced composites can be used as an alternative aircraft structural material.
Author (ESA)

N85-13864*# Steele (R. S.), Greenville, S.C.
GENERIC COMPOSITE FLYWHEEL DESIGNS
R. S. Steele *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 169-179 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 11D

N85-13866*# Lord Corp., Erie, Pa.
FLEXIBLE MATRIX COMPOSITE LAMINATED DISK/RING FLYWHEEL
B. P. Gupta and A. J. Hannibal *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 193-207 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 11D

N85-13867*# General Electric Co., Philadelphia, Pa. Space Systems Div.
GENERAL ELECTRIC COMPOSITE RING-DISK FLYWHEEL: RECENT AND POTENTIAL DEVELOPMENTS
Anthony P. Coppa *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 209-231 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 11D

N85-14014# Rome Univ. (Italy). Dipt. Aerospaziale.
THE DIMENSIONAL STABILITY OF ADVANCED COMPOSITE ANTENNA REFLECTORS: ANALYTICAL AND TEST EVALUATION
M. Marchetti and F. Morganti (Selenia S.p.A., Rome) *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 103-109 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

N85-14172# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
DEVELOPMENT OF DAMAGE IN FATIGUE LOADED CARBON FIBER REINFORCED PLASTICS [SCHADENSENTWICKLUNG IN SCHWINGBEANSPRUCHTEN CFK-LAMINATEN]
H. Huth *In its* The 4th LBF Colloq. Mar. 1984 p 173-190 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

N85-14173# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE BEHAVIOR OF BOLTED JOINTS MADE OF CARBON FIBER REINFORCED EPOXY RESINS [FESTIGKEITSVERHALTEN VON FUEGUNGEN AUS KOHLEFASERVERSTAERKTEN EPOXIDHARZEN]
J. J. Gerharz *In its* The 4th LBF Colloq. Mar. 1984 p 191-222 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-13919 British Library Lending Div., Boston Spa (England).
COMPUTER CALCULATION OF CHEMICAL EQUILIBRIUM IN MULTI-COMPONENT SYSTEMS
V. I. Berdnikov 7 Nov. 1984 8 p refs Transl. into ENGLISH from Izv. (USSR), v. 4, 1984 p 120-122
(BLL-M-35973-(5826.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

A procedure for calculating chemical equilibrium in multicomponent systems is described and its advantages over some others considered. The procedure is based on the Law of Mass Action. Ways of constructing effective algorithms are defined. Author

N85-13920 British Library Lending Div., Boston Spa (England).
THE ELECTROCHEMICAL DEOXIDATION OF MOLTEN OXIDE SUBSTANCES
A. V. Pavlov, Yu. I. Utochkin, and V. A. Grigoryan 7 Nov. 1984 5 p refs Transl. into ENGLISH from Izv. (USSR), v. 4, 1984 p 141-142
(BLL-M-35982-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Experiments were carried out by the e.m.f. (electromotive force) method to study the equilibrium partial pressure of oxygen above basic and silicate synthetic slags with relation to the shortage of excess of oxygen in them. The oxide contents of the slags were varied by electrochemical deoxidation and oxidation, and the effects on the partial pressure of oxygen evaluated. The results agree satisfactorily with those of research molten oxide materials and deoxidizing elements. Author

N85-13921# Bendix Corp., Kansas City, Mo.
DETERMINATION OF HALOGENS AND SULFUR IN ORGANIC COMPOUNDS AND POLYMERS BY COMBUSTION-ION CHROMATOGRAPHY
R. E. Smith and W. R. Davis Aug. 1984 12 p refs
(Contract DE-AC04-76DP-00613)
(DE84-016186; BDX-613-3053) Avail: NTIS HC A02/MF A01

The Schoniger flask combustion technique for sample preparation, followed by ion chromatography for determining the ions produced, was proven to be a simple, rapid, and accurate analytical method. Schoniger flask combustion/ion chromatography can also determine with moderate accuracy the fluorine content of organic compounds. DOE

N85-13922# Iowa State Univ. of Science and Technology, Ames. Rare Earth Information Center.
CRITICAL EVALUATION OF BINARY RARE EARTH PHASE DIAGRAMS Progress Report, 1 Jun. - 30 Nov. 1983
K. A. Gschneider, Jr. and F. W. Calderwood Dec. 1983 155 p refs Sponsored in part by NBS, Molycorp., Inc., Union Oil Co. of Calif., Reactive Metals and Alloys Corp., Ronson Metals Corp., and by Santoku Metal Industry Co., Ltd.
(Contract W-7405-eng-82)
(DE84-015057; IS-RIC-PR-7) Avail: NTIS HC A08/MF A01

The thermodynamic properties of rare earth-gold, rare earth-barium, and rare earth-beryllium alloy systems are discussed along with alloy crystal structure. Phase diagrams are presented. R.S.F.

N85-13923# Ames Lab., Iowa.
BUTENE OXIDATION BY MOLYBDENUM CRYSTALOGRAPHIC SHEAR COMPOUNDS Thesis Iowa State Univ.
Robert Louis McCormick Jun. 1984 138 p refs
(Contract W-7405-eng-82)
(DE84-013910; IS-T-1123) Avail: NTIS HC A07/MF A01

The reduced molybdenum oxides Mo4011-orh, Mo4011-mon, Mo8023, and Mo18052 were synthesized. These compounds, as well as Mo03, were characterized by X-ray diffraction, X-ray photoelectron spectroscopy, Raman and FT-IR spectroscopies, and surface area measurements. The oxides were then studied in a pulsed reactor at 500(0) C in the selective oxidation of butene and butadiene. The data suggested a process in which the surface site must become more oxidized in parallel with the oxidation of the adsorbed hydrocarbon. Evidence supporting this idea included the high selectivity to maleic anhydride observed over a completely oxidized surface and differences in the reactivity of butene and butadiende. In particular, oxygen insertion into butadiene to form furan occurred in the absence of gas phase 02 over the reduced phases, while oxygen insertion into butene required the presence of molecular oxygen. Maleic anhydride formation required the presence of molecular oxygen except in the case of butadiene oxidation over Mo03. The long range ordering of defects, known as crystallographic shear, was not shown to have any influence on the initial interaction of reactant and solid. However, the unusual coordination geometries and surface structures that are thought to be caused by the presence of shear planes may be related to the differences in catalytic selectivity observed for these oxides. DOE

N85-13924# Colorado State Univ., Fort Collins. Dept. of Chemistry.
CHEMICALLY MODIFIED ELECTRODES AND RELATED SOLUTION CHEMISTRY Technical Progress Report, 1 Jun. 1983 - 1 Sep. 1984
C. M. Elliott Sep. 1984 12 p refs
(Contract DE-AC02-81ER-10968)
(DE84-017110; DOE/ER-10968/3) Avail: NTIS HC A02/MF A01

The detailed redox chemistry, spectroscopy, and base binding properties of the heterodinuclear complex RuCl2nic4TPPCo were investigated. A ferric hydroxy porpyrin was synthesized, which promises to be of interest as an electrochemically generated oxidation catalyst. A trimeric iron complex was examined to understand its electronic structure and evaluate it as a potential multielectron redox reagent. Electrodes modified with polymers of Ru(II) (4,4'COOR Bpy)3(+2) were studied with respect to their behavior as potential, practical electrochemic materials. DOE

N85-13925# Karlsruhe Univ. (West Germany). Lehrstuhl und Bereich Feuerungstechnik.
IONIZATION AND TIME STRUCTURE OF FLAMES Final Report [IONISATION UND FLAMMENSTRUKTUR]
Wolfgang Leuckel 1983 95 p refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft
(LE-484/1-2) Avail: NTIS HC A05/MF A01

Ionization and temperature were measured in laminar, turbulent, premixed flames and turbulent diffusion flames in order to analyze the structure of turbulent flames. An ionization probe is shown to be better than thermocouples in measuring flame characteristics especially at the reaction zone boundary and in the measurement of flame propagation. Ionization profiles of turbulent diffusion flames are analyzed to give results concerning flow eddies and flame propagation. Ionization signal form analysis leads to conclusions about the turbulent reaction zone which consists of flow eddies formed from the fuel gas, the drawing-off gas, and air. Author (ESA)

N85-13926# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).
INVESTIGATIONS REGARDING PROCESS ANALYSIS OF LIQUIDS IN THE 1 TO 2 MICROMETER SPECTRAL RANGE Final Report, Dec. 1982
Roland Grisar, Richard Wissler, and Wolfgang Riedel Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 59 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-169; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,50

A laboratory model of a process analyzing system for liquids,

which operates in the 1 to 2 micron range was developed. The system uses two pulse-modulated infrared light emitting diodes and contains an electronic signal processor. For temperature stabilization of light emitting diodes, semiconductor detectors, and logarithmic converter, a zero point drift of 0.3% per week and a detection limit of 0.01% is achieved for water in methanol.
Author (ESA)

N85-13927# Battelle Inst., Frankfurt am Main (West Germany).
INVESTIGATION OF THE OSTWALD RIPENING OF SEPARATED PARTICLES IN LIQUID-LIQUID SYSTEMS UNDER MICROGRAVITY CONDITIONS Final Report, Oct. 1982
Michael Harr and Dieter Langbein Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-037; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

Optically transparent, model alloys with miscibility gaps in the liquid state were investigated. Methods of generating and positioning precipitated droplets were tested and interfacial tensions were determined. Behavior of simple droplet configurations was calculated. Acetylacetone/water is recommanded as the most suitable alloy for microgravity experiments. Author (ESA)

N85-13889*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTROCHEMISTRY AND STORAGE
Lawrence H. Thaller *In its* Space Power Apr. 1984 p 95-99 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 07D

N85-13903*# United Technologies Corp., East Hartford, Conn.
ELECTROCHEMISTRY AND STORAGE PANEL REPORT
J. K. Stedman and G. Halpert (JPL) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 293-296 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-13928 United Kingdom Atomic Energy Authority, Risley (England).
FRACTOGRAPHIC STUDY OF STRESS CORROSION CRACKING OF SUS 304 STAINLESS STEEL IN VARIOUS ENVIRONMENTS
M. Murata and Y. Mukai 5 Jul. 1984 37 p refs Transl. into ENGLISH from the J. of the Japanese Inst. of Metals (Japan), v. 44, 1980 p 713-722 Original language document was announced as A80-52044
(BLL-Risley-Tr-4598-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Stress corrosion cracking (SCC) of austenitic stainless steels in various environments can be divided into the following groups: group A (SCC in the strict sense), a transition group, and group B (SCC with corrosion cracking characteristics). The mechanism of SCC in several groups is studied using fractography. The results show that in group A, fracture planes in SCC were mainly the (100) planes and the SCC growth direction was sensitive to the principal stress. In the transition group and group B, the SCC fracture planes were mainly the (111) planes. In group B, the SCC growth direction was also sensitive to the shear stress. The selectivity of the fracture planes and the stress dependence of SCC appear to be closely related to the corrosiveness of the environment. Author

N85-13929 British Library Lending Div., Boston Spa (England).
CHANGE IN THE NITROGEN CONTENT WHEN NITRIDED ALLOYS ARE HEATED
V. A. Vikhlevshchuk, S. G. Grishchenko, and V. M. Chernogritskii 7 Nov. 1984 7 p refs Transl. into ENGLISH from Stal (USSR), no. 4, 1984 p 27-28
(BLL-M-35946-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Different alloys were heated steadily (in a crucible) and rapidly (in an evacuated chamber). Rates of evolution of nitrogen were determined. Graphs are plotted and conclusions drawn regarding the different rates of evolution from the alloys and the reasons for this. Author

N85-13930 British Library Lending Div., Boston Spa (England).
IMPACT TOUGHNESS OF WIRE AFTER COLD DEFORMATION AND ANNEALING
A. A. Baranov, V. I. Alimov, and V. G. Onoprienko 7 Nov. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1984 p 140-141
(BLL-M-35941-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The influence of initial heat treatment, amount of reduction during cold drawing and final annealing procedure on impact toughness across the fibers of a 5 mm diameter wire of steel containing 0.88% C, 0.65% Mn, 0.29% Si, 0.25% S and 0.014% P was studied. An increase in impact toughness across the fibers of the wire was detected after annealing at 450 C. This is attributable to a decrease in ferrite spacing. With the higher final annealing temperatures (550 and 700 C) the impact strength frequently decreases with increase in the amount of cold deformation. M.G.

N85-13931 British Library Lending Div., Boston Spa (England).
THE INFLUENCE OF MANGANESE ON INTERCRYSTALLINE INTERNAL ADSORPTION OF ARSENIC IN LOW CARBON STEEL
M. A. Shumilov, L. V. Matvienko, V. I. Bondar, L. N. Kudryavtseva, K. N. Sokolov, and V. I. Obmolotkov 7 Nov. 1984 7 p Transl. into ENGLISH from Izv. (USSR), v. 4, 1984 p 68-71
(BLL-M-35965-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The addition of up to 2.4% Mn to ferrite or low carbon nonalloy steel containing up to 0.15% arsenic as a result of competition with intercrystalline internal adsorption of manganese reduces the arsenic content at the ferrite grain boundaries. In the type of steel examined, having a ferrite pearlite structure, manganese reduces the adverse effect of arsenic on the impact strength. Author

N85-13932 British Library Lending Div., Boston Spa (England).
INFLUENCE OF HYDROGEN SATURATION AND PRIOR HEAT TREATMENT ON GRAPHITIZATION OF WHITE CAST IRON
V. I. Shapovalov and N. A. Lenchenko 7 Nov. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 4, 1984 p 66-67
(BLL-M-35964-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

To confirm that the effectiveness of prior low-temperature heat treatment (before graphitization annealing) is due to the presence of hydrogen in irons, the authors tested irons saturated with high-pressure hydrogen. It was found that provided sufficient time is allowed for hydrogen to permeate right through the specimen during saturation treatment, the graphite inclusions will be evenly distributed over the specimen cross-section after low-temperature heat treatment at 300 to 400 C and graphitization annealing. It is assumed that part of this process consists in the diffusional redistribution of hydrogen and carbon atoms in Cottrell atmospheres resulting in the formation of additional graphite nucleation sites. Author

N85-13933 British Library Lending Div., Boston Spa (England).
AUTENITE TRANSFORMATION IN POWDER-COMPACTED CHROMIUM-NICKEL-MOLYBDENUM STEELS DURING CONTINUOUS COOLING

Yu. G. Gurevich, V. I. Rakhmanov, and I. F. Panshin 7 Nov. 1984 4 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 4, 1984 p 140-141
(BLL-M-35981-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Austenite transformation kinetics was studied in ZhGr0.5KhNM sintered and forged specimens with porosities of 17, 10 and 3%. Continuous cooling transformation curves were plotted for each level of porosity. With increasing porosity, there was an increased probability of heterogeneous formation of new phase nuclei with a resultant decrease in the energy of formation of critical nuclei. The observed shift in the M sub s temperature resulted from a decrease in the plastic deformation resistance of austenite due to the influence of porosity. B.W.

N85-13934 British Library Lending Div., Boston Spa (England).
THE EFFECT OF TEMPERATURE AND PRESSURE ON THE COMPOSITION DENSITY OF ALKALINE METALS
E. L. Barbash, O. A. Evdokimenko, and L. I. Yastrebov 7 Nov. 1984 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1984
(BLL-M-35940-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

With an increase in temperature and pressure, the zone structure and composition density of alkali metals changes with considerable lack of uniformity. For lithium, the irregular relation between temperature and composition density was discovered on the Fermi level (n (E sub F)) with a minimum at a temperature of 90 K; for sodium, potassium, rubidium, and cesium, n (E sub F) changes regularly with an increase in temperature. The minimum value for the graph (n (E sub F)) for pressure was found at a pressure of 2 x 2 x 10 to the 9th power Pa for cesium, while this relationship was found to be constant for the other metals. A.R.H.

N85-13935 British Library Lending Div., Boston Spa (England).
DISTRIBUTION OF OXYGEN BETWEEN METAL AND BASIC SLAGS
B. A. Burdonov 7 Nov. 1984 4 p refs Transl. into ENGLISH from Izv. (USSR), v. 3, 1984 p 132-133
(BLL-M-35932-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The equations describing the dependence of the equilibrium coefficient of oxygen distribution between metal and basic slags on the basicity of the slag are reviewed and revised. It is also pointed out that in full-scale investigations of the refining of crude iron of ordinary composition in 300-t converters the oxygen distribution is found to be mainly governed by the carbon content of the metal. Author

N85-13936 British Library Lending Div., Boston Spa (England).
GALVANIZED WIRE PROTECTED AGAINST CORROSION BY CHROMATE PASSIVIZATION
O. V. Kotov, A. D. Vaisman, and L. M. Tudbaseva 7 Nov. 1984 4 p Transl. into ENGLISH from Stal (USSR), v. 3, 1984 p 55
(BLL-M-35908-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The solution used for chromating galvanized wire was found to greatly improve the corrosion-resistance of galvanized wire. Packaging is unnecessary. B.G.

N85-13937 British Library Lending Div., Boston Spa (England).
TESTING OF PRODUCTION OF SILICON-TITANIUM-MAGNESIUM ALLOYING COMPOSITION
D. D. Zheltov, V. P. Soloshenko, A. G. Likhachev, V. I. Erko, and L. F. Pekarskii 7 Nov. 1984 6 p refs Transl. into ENGLISH from Stal (USSR), v. 3, 1984 p 31-32
(BLL-M-35904-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

An examination is made of the production of an alloying composition containing 3-6%Mg, 4-10%Ti, and 50-60%Si by means of dissolution of titanium and magnesium in liquid ferrosilicon. Several production methods have been tested to determine the optimum technology. Data are given on industrial batches of Si-Ti-Mg alloying composition produced by the method of successive introduction of titanium and magnesium. Author

N85-13938 British Library Lending Div., Boston Spa (England).
THERMAL DIFFUSIVITY AND CONDUCTIVITY OF CHROMIUM-MANGANESE ALLOYING COMPOSITIONS
A. P. Radkov, N. V. Panteleeva, and Yu. P. Filimonov 7 Nov. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 3, 1984 p 117-119
(BLL-M-35925-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

An experimental analysis was made of the thermal diffusivity of chromium manganese alloying compositions at a temperature of 25-850 C. The thermophysical characteristics of the compositions were studied by the method of laser bursts with simultaneous contact measurement of temperature. For determination of thermal conductivity, an experimental study was made of the temperature dependence of the specific heat of the alloying compositions in the range 100-800 C. Statistical processing of results was carried out by the least squares method. Author

N85-13939 British Library Lending Div., Boston Spa (England).
ACCURACY OF PREPARATION OF THREE-DIMENSIONAL REFERENCE GRID
V. A. Belevitin and S. A. Bobkov 7 Nov. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 3, 1984 p 60-62
(BLL-M-35921-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A three-dimensional reference grid prepared in specimens of lead-antimony alloy by the suggested procedure are perfectly acceptable as regards preparation accuracy for determination of the three-dimensional flow of metals in the various plastic deformation processes, as its error is no greater than an average of 0.69% and follows the normal distribution law, and its mutually orthogonal spacings are uniforms. Author

N85-13940 British Library Lending Div., Boston Spa (England).
INFLUENCE OF INTER-LAYER EFFECT ON CHARGE GAS-PERMEABILITY
V. O. Veishedel, B. G. Plastinin, A. A. Trishkin, A. M. Li, and A. G. Zakharov [1984] 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 3, 1984 p 27-29
(BLL-M-35919-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Effects at the boundaries between layers of different granular solids in metallurgical plants are considered and equations derived. Results of experiments carried out with layers of coke and sinter confirm the correctness of the theoretical approach. It is concluded that when materials of different size are charged in layers it is necessary to allow for the mutual arrangement of layers in calculations of local pressure losses. Author

N85-13941 British Library Lending Div., Boston Spa (England).
REPRODUCIBILITY OF READINGS FROM OXYGEN CONCENTRATION ELEMENTS
S. A. Dulyaninov, V. P. Luzgin, and I. V. Zinkovskii 7 Nov. 1984 6 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 3, 1984 p 43-45
(BLL-M-35920-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The equipment used for measuring the activity of oxygen in molten steel is described, and an equation for its determination is given. The relative error does not exceed 10%. Reproducibility of readings depends on a number of listed factors. Author

N85-13942 British Library Lending Div., Boston Spa (England).
THEORY OF KINETICS OF IMPREGNATION OF POROUS BODIES
A. A. Shatov, A. A. Zhukhovitskii, G. A. Grigorev, and A. N. Borodin 7 Nov. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 3, 1984 p 8-11
(BLL-M-35917-(5828.4)) Copyright. Avail: British Library Lending

Div., Boston Spa, Engl.

Porous bodies having a system of small-diameter pores connected to larger pores are modelled using a system of large capillaries from which small capillaries branch out. A mathematical description of the kinetics of impregnation of such a capillary system by liquid is given. The results of an experimental study of the kinetics of octane impregnation of two porous carriers are discussed. It is established that the characteristics of porous bodies can be found from data of the kinetics of impregnation. Author

N85-13943 National Physical Lab., Teddington (England). Div. of Materials Applications.

COST 50 - MATERIALS FOR GAS TURBINES, PART 1 AND 2 3UK9 Final Report

Feb. 1984 85 p refs

(NPL-DMA(A)-74; ISSN-0143-7313) Copyright. Avail: Issuing Activity

The effect of trace elements on the creep properties at high temperature of an Ni-Cr-base alloy, and the microstructural characteristics of revert superalloys were studied. For individual titles, see N85-13944 through N85-13945.

N85-13944 National Physical Lab., Teddington (England). Div. of Materials Applications.

THE EFFECT OF TRACE ELEMENTS ON THE PROPERTIES AT HIGH TEMPERATURE OF A Ni-Cr-BASE ALLOY

S. Osgerby and T. B. Gibbons *In its* COST 50 - Mater. for Gas Turbines, Pt. 1 and 2 3UK9 Feb. 1984 37 p refs (For primary document see N85-13943 05-26)

Copyright. Avail: Issuing Activity

The effect of trace elements on the creep and stress rupture performance at 850 C of the high-chromium alloy IN939 used for blades and stators in land-based gas turbines, and the effects of prestrain at room temperature on creep performance were studied. Results show that Pb and Bi seriously degrade creep performance, independently of base alloy ductility. Impurities increase grain boundary cavities, resulting in premature failure. Specimens of the base alloy prestrained before creep testing show a similar deterioration in performance and increased incidence of creep cavitation. Author (ESA)

N85-13945 National Physical Lab., Teddington (England). Div. of Materials Applications.

THE MICROSTRUCTURAL CHARACTERISTICS OF REVERT SUPERALLOYS

P. N. Quested, R. Rosenthal (Imperial College of Science and Technology), and M. S. Peck *In its* COST 50 - Mater. for Gas Turbines, Pt. 1 and 2 3UK9 Feb. 1984 44 p refs (For primary document see N85-13943 05-26)

Copyright. Avail: Issuing Activity

The formation of microporosity in recycled IN100 and MarM002 was studied. Virgin, single revert, and multiple revert casts were used, and the surface of the revert material was removed by chemi-milling to eliminate high concentrations of nitrogen. Samples of virgin casts deliberately doped with nitrogen were also examined. Results show a higher microporosity level associated with revert casts; a change in shape of the carbides from an acicular to a more blocky shape when the alloy is recycled; higher analyzed nitrogen levels in the revert alloys; and more complex structures for the carbides in the revert alloys.

Author (ESA)

N85-13946# Colorado Univ., Boulder. Dept. of Chemistry.

MACROCYCLIC POLY(TERTIARY) PHOSPHINES FOR THE ATTACHMENT OF METALS TO SURFACES OF PHOTODEVICES Final Technical Report, 1 Aug. 1979 - 14 Sep. 1982

Arlan D. Norman Apr. 1984 23 p refs

(Contract DE-FG02-80CS-83112)

(DE84-015552; DOE/CS-83112/T1) Avail: NTIS HC A02/MF A01

General syntheses of primary and secondary alkenylphosphines, essential synthons in metal templated cyclooligomerization reactions, from LiAl (PH2) 4 phosphination of alkenyl halides and Me3SiPH2 radical addition to alkenes, were developed and series of bis and tris(alkenylphosphino) metal complexes were prepared. In novel metal templated reactions, [15] and -P3 and [12]ane-P3 macrocyclic phosphines coordinated to Mo and W [eg. (CO)3Mo (PHC4H8)3] were synthesized by radical promoted cyclooligomerization of the respective alkenylphosphino-metal complexes. Radical reactions of his(alkenyl) phosphino metal complexes produce unique acyclic alkenyldiphosphino complexes [eg. (CO)4Mo(H2PC3H6PHCH2CHCH2)]. Cyclooligomerization of alkenylphosphines attached to nonmetal (Si and Ge) centers was pursued as potential routes to easily obtained noncoordinated phosphine macrocycles. Derivation and substitution of acyclic and cyclic phosphine complexes, for ultimate attachment to surfaces of photoactive substances, pursued. DOE

N85-13947# Massachusetts Inst. of Tech., Cambridge.

INVESTIGATION OF MATERIALS FOR INERT ELECTRODES IN ALUMINUM ELECTRODEPOSITION CELLS Quarterly Report, Jan. - Mar. 1984

Jul. 1984 6 p refs

(Contract DE-FG07-83ID-12380)

(DE74-015036; DOE/ID-12380/6) Avail: NTIS HC A02/MF A01

Three compositions in the NiO-Fe2O3 system were tested in the laser-heated floating zone apparatus. Acquired literature was used to generate the NiO-Fe2O3 phase diagram and begin a list of possible dopant additions to this system. Construction of the bench scale Hall cell was completed. The reference electrode was further developed. The TiB2 synthesis program concentrated on issues related to the volatilization of liquid reactants and on procedures necessary to do experiments safely. DOE

N85-13948# Oak Ridge National Lab., Tenn.

TENSILE PROPERTIES AND SWELLING OF 20%-COLD-WORKED TYPE 316 STAINLESS STEEL IRRADIATED IN HFIR

R. L. Klueh and M. L. Grossbeck 1984 22 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984

(Contracts DE-AC05-84OR-21400; W-7405-eng-26)

(DE84-014080; CONF-840604-13) Avail: NTIS HC A02/MF A01

Immersion density and elevated temperature tensile properties were determined on 20% cold worked type 316 stainless steel irradiated in the high flux isotope reactor (HFIR) at approximately 285, 370, 470, 560, and 620 C to fluences of 1.8 to 6.2 x 10 to the 26th power neutrons/sq m, which resulted in displacement damage levels of 16 to 54 dpa and helium concentrations of 900 to 3300 at. ppd. Tensile tests were done at temperatures near the estimated irradiation temperature. Swelling increased with increasing irradiation temperature to a maximum of 2.1% at 620 C. Irradiation at the lowest temperature (285 and 370 C) increased the strength. At the higher irradiation temperatures, the strength decreased during irradiation. Ductility generally reflected the strength behavior an increase in strength resulted in a decrease in ductility. When the present data are compared with previously published data, there is good agreement with one exception. Previous experiments showed a large decrease in ductility when irradiated at 600 C and tested at 575 C that was not observed in the present tests. There was also good EBR-II-irradiated steel. DOE

N85-13949# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.

MULTIAXIAL YIELD BEHAVIOR OF 1100 ALUMINUM FOLLOWING VARIOUS MAGNITUDES OF PRESTRAIN

M. Stout, P. L. Martin, D. E. Helling (Stanford Univ., Calif.), and G. R. Canova (Metz Univ. 57, France) 1984 16 p refs Presented at the Intern. Symp. on Current Theories of Plasticity and Applications, Norman, Okla., 30 Jul. - 3 Aug. 1984

(Contract W-7405-eng-36)

(DE84-013904; LA-UR-84-1887; CONF-840746-2) Avail: NTIS HC A02/MF A01

It was found that there are several regimes of yield and flow behavior for 1100 aluminum. At strain levels below those which form shear bands, small scale yield behavior, as reflected by

.000005 offset yield criterion, is governed by the developing dislocation cell substructure. The yield locus is distorted and translated in the direction of the applied stress. This is because the cell structure knows the directional history of deformation. If a large offset yield criterion is used to evaluate behavior the yield locus is quite different. It is distorted very little and essentially does not translate. What distortions occur match those predicted by a texture based polycrystal plasticity theory. Large scale yielding is only a function of texture, not microstructure. After grain scale shear bands form, (at a von Mises effective strain of approximately 0.5 for aluminum in rolling), texture alone no longer controls large offset strain yielding. These shear bands, which possibly form due to the developing texture and relaxed constraints on deformation, have a specific orientation, which produces an isotropies in plastic flow independent of texture. DOE

N85-13950# Purdue Univ., Lafayette, Ind. School of Materials Engineering.

ZERO-FLUX PLANES AND FLUX REVERSALS IN MULTICOMPONENT DIFFUSION Progress Report, 2 Sep. 1983 - 31 Aug. 1984

M. A. Dayananda Aug. 1984 36 p refs
(Contract DE-AC02-81ER-10814)
(DE84-015212; DOE/ER-10814/11) Avail: NTIS HC A03/MF A01

The principal area of research is interdiffusion in multicomponent alloys for the development of the zero-flux planes and flux reversals, diffusion paths and diffusion structures and analytical representation of ternary and quaternary diffusion paths. The systems under investigation are the ternary and quaternary systems: Cu-Ni-Zn, Fe-Ni-Cr, Cu-Ni-Zn-Mn and Ni-Co-Cr-Mo. DOE

N85-13951# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

SECONDARY FLUORESCENCE EFFECTS ON X-RAY MICROANALYSIS

P. Angelini and J. Bentley 1984 3 p refs Presented at the 42nd Ann. Electron Microscopy Society of America Meeting, Detroit, 13 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE84-016600; CONF-840848-7) Avail: NTIS HC A02/MF A01

The structure and composition of intergranular phases present in TiB2 hot pressed or sintered with Ni additive were analyzed to evaluate sintering mechanisms. Analytical electron microscopy (AEM) has shown that the major intergranular phase present in TiB2 hot pressed with Ni is Ni3B, but in TiB2 sintered with Ni is a boride tau phase. Energy dispersive x ray spectroscopy (EDS) of the intergranular Ni3B indicated a normalized Ti content of approx. 8 at.%. It is shown that Ni3B is a line compound with limited Ti solubility. The suspected influence of secondary fluorescence effects on EDS analyses is addressed. DOE

N85-13952# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

GLOW DISCHARGE AMORPHOUS SILICON TIN ALLOYS

A. H. Mahan, A. Sanchez (Universidad Nacional Autonoma de Mexico), D. L. Williamson (Colorado School of Mines), B. vonRoedern, and A. Madan Jun. 1984 7 p refs Presented at the 17th IEEE Photovoltaics Spec. Conf., Kissimmee, Fla., 1-5 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-013001; SERI/TP-212-2355; CONF-840561-21) Avail: NTIS HC A02/MF A01

We present basic density of states, photoresponse, and transport measurements made on low bandgap s-SiSn:H alloys produced by RF glow discharge deposition of SiH4, H2 and Sn(CH3)4. Major changes in the local bonding structure and the density of states are demonstrated, yet the normalized photoresponse remains poor. It is shown that two types of defect levels are produced with Sn alloying, and that the resultant density of states increase explains not only the n to p-type conductivity transition, but also the photoresponse behavior. It is reported that a-SiSn:H can be doped with P. From our device analysis we suggested that to improve the alloy performance, the density of states should be decreased to levels comparable to or lower than those presently obtained in a-Si:H. DOE

N85-13953# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

EFFECTS OF IRRADIATION FLUENCE AND CREEP ON FRACTURE TOUGHNESS OF 347/348 STAINLESS STEEL

F. M. Haggag, W. L. Server, W. G. Reuter, and J. M. Beeston 1984 25 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984
(Contract DE-AC07-76ID-01570)
(DE84-016091; EGG-M-07684; CONF-840604-20) Avail: NTIS HC A02/MF A01

The postirradiation fracture toughness of Type 347/348 stainless steel as investigated using 5.08 mm thick three point bend specimens tested at 427(0)C. The J/sub Ic/ values were determined using the single specimen unloading compliance technique in accordance with ASTM F 813-81. Equivalent values of plane strain fracture toughness, K/sub Ic/, were computed from experimentally determined J/sub Ic/ values for several fluence levels ranging from 2.3 to 4.8 x 10(22) n/cm(2) (E > 1.0 MeV) and for irradiation creep of 0.0, 0.6, 1.1, and 1.8%. The test matrix involved four variables: fluence, creep, helium content, and heat to heat variation. It is shown that an interpolated trend exists, i.e., K/sub Ic/ decreases with increasing combinations of fluence, creep, and helium content. It is suggested that irradiation creep had less effect on reducing K/sub Ic/ than was suggested previously. DOE

N85-13954# Brookhaven National Lab., Upton, N. Y.

CURRENT AND POTENTIAL TRANSIENTS DURING LOCALIZED CORROSION OF STAINLESS STEEL

Hugh S. Isaacs and Yuichi Ishikawa (Mitachi Ltd., Tauchiura, Japan) 1984 13 p refs Presented at the Fall Meeting of the Electrochem. Soc., New Orleans, 7-12 Oct. 1984
(Contract DE-AC02-76CH-00016)
(DE84-014100; BNL-34775; CONF-841058-4) Avail: NTIS HC A02/MF A01

The currents flowing from a localized corrosion site (LCS) on passive stainless steel in air saturated 0.25 M NaCl were studied by vibrating probe electrode. The potential behavior during applied currents was analyzed by assigning equivalent circuits to the passive surface and the localized site so that the paths of the current across the passive surface and the LCS could be calculated and compared with the measured values. The equivalent circuit of the passive surface without active localized corrosion was determined from potential transients and it was found that it is dependent on the prior history of the electrode. The LCS was equated to a resistance with an emf which were calculated from the LCS current and specimen potential. The variations of this resistance are attributable to changes in solution resistance adjacent to the LCS. It is found that the capacitance of the passive surface played a major role during potential transients and the initiation of pitting. DOE

N85-13955# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

VOLATILITY OF VANADIUM FROM A CANDIDATE FUSION TRACTOR ALLOY

S. P. Henslee 8 Jun. 1984 6 p refs Presented at the Ann. Meeting of the Am. Nucl. Soc., New Orleans, 3 Jun. 1984
(Contract DE-AC07-76ID-01570)
(DE84-015277; EGG-M-02284; CONF-840614-97) Avail: NTIS HC A02/MF A01

The volatility of vanadium from a candidate fusion reactor structural alloy, the Path C alloy V-15 Cr-5 Ti, was investigated in both air and CO2 as a function of time and temperature. The purpose of this research was to measure the potential release of material from the structure of a fusion reactor resulting from the oxidation and volatilization of the structural material as a consequence of some severe accident. DOE

N85-13956# Hanford Engineering Development Lab., Richland, Wash.
SWELLING BEHAVIOR OF TITANIUM-MODIFIED AISI 316 ALLOYS
F. A. Garner 1984 8 p refs
(Contract DE-AC06-76FF-02170)
(DE84-013940; HEDL-7373) Avail: NTIS HC A02/MF A01

It appears that titanium additions to stainless steels covering a wide compositional range around the specifications of AISI 316 result only in an increased delay period before neutron-induced void swelling proceeds. Once swelling is initiated the post-transient behavior of both annealed and cold-worked steels is quite consistent with that of AISI 316, approaching a relatively temperature-independent swelling rate of approx. 1%/dpa. DOE

N85-13957# Acieries Reunies de Burbach-Eich-Dudelange S.A., Voelklingen (West Germany). Saarstahl G.m.b.H.
INCLUSION FORMATION DURING SOLIDIFICATION OF STEELS WITH IMPROVED MACHINABILITY Final Report, Nov. 1983
Rudolf Jauch and Dieter Prem Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 249 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-160; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 41,50

The machinability of the inclusion structure from the ingot to the finished steel was investigated. In free machining grades containing 0.3% s, machinability can be improved by additions of Pb and Te. Grades without Te and with poor oxide purity show a strong deterioration of machinability. In Al-containing fine grain case-hardening grades and grades for quenching and tempering, the addition of Ca leads to globular oxides. Tellurium causes sulfide inclusion, resulting for steel with 0.07% S in transverse toughness properties comparable to steel with 0.03% S. Author (ESA)

N85-13958# KERNCO, Inc., Danvers, Mass. Inst. fuer Reaktorwerkstoffe.
INVESTIGATION OF THE ISOTHERMAL PRECIPITATION BEHAVIOR OF NICKEL-BASE ALLOYS USING ELECTROCHEMICAL PHASE EXTRACTION Thesis - Technische Hochschule, Aachen
H. Kirchhoefer, J. Rottmann, F. Schubert, and Nickel Mar. 1984 138 p refs In GERMAN; ENGLISH summary
(JUEL-1903; D-82; ISSN-0366-0885) Avail: NTIS HC A07/MF A01

Electrochemical phase extraction methods were developed empirically for the selective separation of the precipitates in metallic materials, particularly nickel-base alloys. Sixteen model alloys were prepared as test electrodes and the electrolyte composition was varied over a wide range. The results enabled a series of effects to be explained on the basis of electrochemical data. In the nickel-base alloys, titanium carbonitride and primary M6C precipitates are identified. During isothermal aging, M23C6 (except in Alloy KSN), Ni3A1 (in Inconel 617), Laves phases (in Hastelloy X and Inconel 617), M12C (in Hastelloy X and Inconel 617) and alpha tungsten (in the tungsten-containing alloys) are precipitated. The precipitation behavior in the alloys changes from intracrystalline to intercrystalline with increasing aging temperature. The intracrystalline secondary precipitations affect the microhardness, structure and the solid-solution lattice. Author (ESA)

N85-13959# Krupp (Fried.) G.m.b.H., Essen (West Germany). Krupp Forschungsinst.
NITINOL DEVICES, PHASE 2, INTEGRATION OF SLIP RING SYSTEM AND TRACKING MECHANISM WITH MEMORY DRIVE Final Report, Mar. 1980
Joachim Jorde and Hans-Georg Reiss Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 57 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-032; ISSN-0170-B39) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

Reversible memory effects of NiTi alloys are treated. A tracking mechanism with memory drive elements was manufactured and tested, and integrated in the slip ring system. Results show that no gearing is required to produce small angular steps (0.3 are deg.) because the memory drive elements themselves perform this task. A slip ring tracking mechanism module is available. Author (ESA)

N85-13960# Technische Hochschule, Aachen (West Germany). Geisserei-Inst.
CONTROLLED DIRECTIONALLY SOLIDIFIED PRECISION CASTING FOR SUPERALLOYS AND STEELS Final Report, Jan. 1984
Peter R. Sahm, Wolfgang Axmann, Adolf Donner (Thyssen Giesserei AG), and Juergen Preuhs (Thyssen Giesserei AG) Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 130 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-198; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23

Directional solidification (DS) of gas turbine blades was achieved to make available DS cast parts and to develop DS-process control. An investment mold ceramic was developed, vacuum DS equipment was assembled, and microprocessor based process control was developed. The ceramic mold has sufficient high temperature stability against reactive superalloy melt. The laboratory and pilot DS-furnaces for superalloys and steel thermophysical data extraction operate well. Software for in-situ DS-process control is satisfactory. A finite element method software package to model two and simplified three dimensional geometry in nonstationary cases is described. Author (ESA)

N85-13961# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.
CHARACTERIZATION OF ALUMINUM ALLOY 7010 IN MODERATE WIDTH PLATE AND T651 AND T7651 METALLURGICAL STATES [CARACTERISATION DE L'ALLIAGE D'ALUMINIUM 7010 EN TOLE SEMI-EPAISSE, AUX ETATS METALLURGIQUES T 651 ET T 7651, PROCES VERBAL NO. 44-606/F]
G. Hilaire and Y. Barbaux 6 Jul. 1984 51 p In FRENCH
(Rept-44-606/F) Avail: NTIS HC A04/MF A01

Tests were carried out an 30 and 45 mm 7010 aluminum plates to check an expected 10% improvement in the mechanical characteristics compared with 7075 series. Favorable results in fatique, stress corrosion and tenacity are observed, but the significance of these advantages is not statistically demonstrated. Author (ESA)

N85-14174# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE BEHAVIOR OF SINTERED STEELS AND MEASUREMENT CRITERIA FOR SINTERED PREFABRICATED PARTS [FESTIGKEITSVERHALTEN VON SINTERSTAEHLEN UND BEMESSUNGSKRITERIEN FUER GESINTERTE FERTIGTEILE]
C. M. Sonsino *In its* The 4th LBF Colloq. Mar. 1984 p 223-247 refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-13962*# Solarex Corp., Rockville, Md.
PROCESS RESEARCH OF POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report, 1 Apr. - 30 Jun. 1984
J. S. Culik Sep. 1984 11 p refs
(Contract NAS7-100; JPL-956698)

(NASA-CR-174130; DE84-016497; DOE/JPL/956698-84/3; QR-3) Avail: NTIS HC A02/MF A01 CSCL 11B

Work performed during the third quarter of an effort that began in November 1983 is summarized. The intent of this program is to develop a passivation process (hydrogenation) that will improve the power generation of solar cells fabricated from presently-produced, large-grain, cast polycrystalline silicon (Semix), a potentially low-cost material. The program will consist of two phases. The first objective will be to verify the operation of a DC plasma hydrogenation system and to investigate the effect of hydrogen on the electrical performance of a variety of polycrystalline silicon solar cells. The second objective will be to parameterize and optimize a hydrogenation process for cast polycrystalline silicon, and will include a process sensitivity analysis. The sample preparation for the first phase is described. Additional results are summarized that were obtained using a hydrogenation system without a plasma. DOE

N85-13963# Department of the Air Force, Washington, D.C.
THERMALLY STABLE THERMOSET RESIN COMPOSITIONS Patent Application
B. A. Reinhardt, inventor (to Air Force) Filed 25 Jul. 1984 17 p (AD-D011274; US-Patent-Appl-SN-634345) Avail: NTIS HC A02/MF A01 CSCL 11/9

The present invention provides novel thermally stable resins based on an arylether compound having terminal phenylethynyl groups. The resins are cured by heating, either in air or under an inert atmosphere such as argon, nitrogen, or the like. The compositions are particularly suitable for use in the fabrication of reinforced composite structures and for use as high temperature adhesives and coatings. GRA

N85-13964# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev. Energy Measurements Group.
OPTICAL CHARACTERIZATION OF RADIATION-RESISTANT FIBERS
Vern N. Smiley, Bruce M. Whitcomb, Mark A. Peressini, Daniel E. Whitaker, Randy L. Flurer, Christopher W. Colburn, Peter B. Lyons (Los Alamos Scientific Lab., N. Mex.), James W. Ogle (Los Alamos Scientific Lab., N. Mex.), and Larry D. Looney (Los Alamos Scientific Lab., N. Mex.) 1984 23 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984
(Contract DE-AC08-83NV-10282)
(DE84-015248; EGG-10282-1056; CONF-840872-8) Avail: NTIS HC A02/MF A01

Step index fibers with pure silica cores which are expected to have good radiation hardness properties were measured. The measurements include spectral attenuation, numerical aperture, and bandwidth. Values for the preceding quantities are given for several step index fibers of various diameters including the following: plastic clad silica (PCS), OSF-AS, Raychem VCS, Dainichi Diaguide and Ensign-Bickford fiber. Computer controlled instrumentation which was developed for these measurements is described. DOE

N85-13965# Nevada Univ., Reno.
PHOTOPHYSICAL STUDIES OF TRIPLET EXCITON PROCESSES IN PURE POLYMER FILMS Technical Report, 28 Jul. 1983 - 27 Jul. 1984
R. D. Burkhart Aug. 1984 12 p refs
(Contract DE-AS08-83ER-45036)
(DE84-016258; DOE/ER-45036/1) Avail: NTIS HC A02/MF A01

Poly(N-vinylcarbozole) delayed luminescence quantum yields of poly(N-vinylcarbazole) were characterized and triplet exciton migration and transfer in polystyrene. Samples of poly(N-vinylcarbazole) (PVCA) were prepared with varying free radical initiator contents and varying polymerization temperature. Molecular weights and delayed luminescence spectra were obtained. Polystyrene with acetophenone-like groups at chain ends is being explored for measurement of exciton migration and transfer. DOE

N85-13966# California Univ., Livermore. Lawrence Livermore Lab. Building Ventilation and Indoor Air Quality Program.
VOLATILE ORGANIC EMISSIONS FROM ADHESIVES WITH INDOOR APPLICATIONS
J. R. Girman, A. T. Hodgson, A. S. Newton, and A. W. Winkes (Landbouwhogenschool Wageningen) Feb. 1984 12 p refs Presented at the 3rd Intern. Conf. on Indoor Air Quality and Climate, Stockholm, 20-24 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-015965; LBL-17594; CONF-840803-7) Avail: NTIS HC A02/MF A01

Volatile organic compounds (VOC) emitted from building materials are a potentially important source of indoor air pollution. Emissions of VOC from both solvent and water based adhesives were investigated. The compounds emitted by adhesives are toluene, styrene, and a variety of normal, branched, and cyclic alkanes. The measured emission rates ranged from below the limit of detection for some adhesives to a total alkane emission rate of over 700 (MU)g g(-1)h(-1) for a water based adhesive. A well mixed tank model was used to assess the potential impacts of the adhesives and to demonstrate that adhesives can be significant sources of VOC. DOE

N85-13967# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
HIGH TEMPERATURE CORROSION OF CERAMICS Final Report
J. R. Blachere and F. S. Pettit Jun. 1982 96 p refs
(Contract DE-AC02-81ER-10915)
(DE84-017084; DOE/ER-10915/4; SETEC-MME-85-002) Avail: NTIS HC A05/MF A01

Materials under study were Al2O3, silicon nitride and silicon carbide with various microstructures and impurity levels, and a high purity SiO2 glass. The investigation emphasized the fundamental understanding of the high temperature corrosion of these materials in various atmospheres related to gas turbine operations. This includes gaseous corrosion and corrosion in the presence of deposits stable at high temperatures in those atmospheres. The SO3-SO2-O2 atmosphere was emphasized with the corresponding Na2SO4 deposit. No reaction was observed between high purity silicon nitride or silicon carbide and SO3-SO2-O2 mixture at 1000(0)C. No significant impurity concentration was found in the oxide layers formed at 1000(0)C. Sulfates formed with some impurities when they had been concentrated in the oxide layer during prior oxidation at 1400(0)C. With Na2SO4 deposits in SO3 containing atmospheres, little hot corrosion was observed for the high purity Si3N4 and SiC. it was usually characterized by the formation of cristobalite globules under the salt. In general, the Na2SO4 deposits tend to bring the impurity effects, observed in oxidation experiments, down to lower temperatures. DOE

N85-13968# Vertrotex Saint-Gobain, Chambery (France).
PARAMETRIC STUDY OF THE P9 HT GLASS FIBER FINISH (FATIGUE RESISTANCE). LOT NO. 1: REPORT ON THE MICROFATIGUE TESTS [ETUDE PARAMETRIQUE DE L'ENSIMAGE P9 HT DE LA FIBRE DE VERRE (TENUE A LA FATIGUE). LOT NO 1: COMPTE-RENDU DES ESSAIS DE MICROFATIGUE]
G. Morel 12 Dec. 1983 59 p In FRENCH
(Contract VSG-82.960.14.00.471.75.86)
(CS-794) Avail: NTIS HC A04/MF A01

The microfatigue test, which allows the utilization of an 800 tex cord, was used to characterize the fatigue behavior of R P9 H7 epoxy preimpregnated glass fiber. The finish content, the finish aging, the epoxy resin composition and the time in storage of the glass fiber before preimpregnation were studied. Storage time is the only significant factor found. There is an increase in fatigue resistance for long storage periods (8 to 9 months), and a reduction for short periods (1 to 2 months). Author (ESA)

N85-14013# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. for Structural Mechanics.
INFLUENCE OF THERMAL CYCLING ON THE BEHAVIOR OF CFRP MATERIAL FOR SPACE STRUCTURES
W. Hartung *In* ESA Workshop on Mech. Technol. for Antennas

Sep. 1984 p 97-101 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-13969# Department of the Air Force, Washington, D.C.
SAFING AND ARMING MECHANISM Patent Application
L. V. Giladett, inventor (to Air Force) Filed 31 Jul. 1984 0011 p
(AD-D011261; US-Patent-Appl-SN-636454) Avail: NTIS HC A02/MF A01 CSCL 19/1

An out-of-line safing and arming mechanism includes an explosive chain having one link movably mounted on a slider to be removed from the chain in a safing configuration and to be located in the chain in an arming configuration. A head prevents the slider from moving into an arming position and is attached to the slider by an annular connecting system which is stronger in tension and compression than it is in shear. The connecting section is broken by activation of an explosive charge which is located within the connecting section and generates forces tending to shear the connecting section as well as forces tending to move the slider toward an arming position. GRA

N85-13970# Ohio Dept. of Energy, Columbus.
ALCOHOL FUEL FROM OHIO FARMS: AN INTRODUCTION
1984 32 p refs
(TI-84-901290; NP-4901250) Avail: NTIS HC A03/MF A01

Technical, marketing and regulatory issues involved in on-farm alcohol fuel production are introduced. Sources of additional information and assistance are provided for the farmer who is considering on-farm alcohol fuel production as a serious business investment, who is willing to expend an effort to sort out the facts, and who can make decisions based upon potential economic returns. DOE

N85-13971# Brookhaven National Lab., Upton, N. Y.
ADDITIVES FOR HEAT ENGINE COAL SLURRY FUELS
T. Butcher, W. Siegeir, and R. Sapienza May 1984 17 p refs Presented at the 4th DOE Heat Engines Contractors' Meeting, Morgantown, W. Va., 1-3 May 1984
(Contract DE-AC02-76CH-00016)
(DE84-016434; BNL-35051; CONF-8405138-2) Avail: NTIS HC A02/MF A01

The use of additives for combustion improvement and control of emissions and ash related difficulties associated with the use of cleaned coal-water slurries in gas turbines and diesel engines was evaluated. Initial screening of candidate combustion additives is performed by thermogravimetric analysis (TGA) method. It appears that potassium compounds offer distinct benefits in promoting coal combustion. Sodium hydroxide is less effective and lithium hydroxide appears to promote soldering. The TGA patterns for all the alkaline compounds show very sharp weight loss rates at ignition, but ignition temperatures and subsequent combustion rates differ significantly. The fouling and corrosion problems associated with the alkali compounds will certainly preclude their use as combustion additives. For the salts those additives with organic anions promote ignition over the halides, however, the halide salts seem to be more effective at sustaining combustion. The soluble additives can be uniformly deposited over the entire wettable surface of the coal, yet in many cases the actual catalyst would be water insoluble. Comparisons with insoluble additive, such as the active catalysts derived from soluble additives points to combination improvements due to better catalyst dispersion. E.A.K.

N85-13972# Pacific Northwest Lab., Richland, Wash.
BIOMASS THERMOCHEMICAL CONVERSION PROGRAM Annual Report, 1983
G. F. Schiefelbein, D. J. Stevens, and M. A. Gerber Aug. 1984 78 p refs
(Contract DE-AC06-76RL-01830)
(DE84-017177; PNL-5096) Avail: NTIS HC A05/MF A01

Highlights of progress achieved in the program of thermochemical conversion of biomass into clean fuels during 1983 are summarized. Gasification research projects include: production of a medium Btu gas without using purified oxygen at Battelle-Columbus Laboratories; high pressure (up to 500 psia) steam oxygen gasification of biomass in a fluidized bed reactor at IGT; producing synthesis gas via catalytic gasification at PNL; indirect reactor heating methods at the Univ. of Missouri-Rolla and Texas Tech. Univ.; improving the reliability, performance, and acceptability of small air blown gasifiers at Univ. of Florida-Gainesville, Rocky Creek Farm Gasogens, and Cal Recovery Systems. Liquefaction projects include: determination of individual sequential pyrolysis mechanisms at SERI; research at SERI on a unique entrained, ablative fast pyrolysis reactor for supplying the heat fluxes required for fast pyrolysis; work at BNL on rapid pyrolysis of biomass in an atmosphere of methane to increase the yields of olefin and BTX products; and research at the Georgia Inst. of Tech. on an entrained rapid pyrolysis reactor to produce higher yields of pyrolysis oil. DOE

N85-13973# Southwest Research Inst., San Antonio, Tex.
SYNTHESIS OF TRANSIT PRACTICE: DIESEL FUEL QUALITY AND EFFECTS OF FUEL ADDITIVES Final Report
David S. Moulton and Norman R. Sefer May 1984 72 p refs Prepared for Transportation Research Board, Washington, D.C.
(Contract DTUM-81-C-72012)
(PB84-235688; TRB-NCTRP-SYN-3; ISBN-0-309-03569-4; LC-84-50866) Avail: NTIS HC A04/MF A01 CSCL 21D

Detailed information is presented on costs, benefits, and adverse effects of available fuel additives and related products. In recent years, environmental awareness, economic pressures, and a general decline in crude oil quality have caused transit operators to seek ways to make use of fuel additives and less expensive blends. Information is presented on the evaluation of fuel additives and related products in terms of their effects on vehicle maintenance requirements, emissions control, fuel economy, fuel storage, and engine performance. R.S.F.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-13974# Energetics, Inc., Columbia, Md.
ECUT ENERGY DATA REFERENCE SERIES: LIGHTWEIGHT MATERIALS FOR GROUND TRANSPORTATION
R. B. Abarcar, G. J. Hane (Pacific Northwest Lab.), and D. R. Johnson (Pacific Northwest Lab.) Jul. 1984 40 p refs
(Contract DE-AC06-76RL-01830)
(DE84-015269; PNL-5192) Avail: NTIS HC A03/MF A01

This report summarizes information that describes the use of lightweight materials in automobiles. The information on this mode of transportation represents the largest potential energy savings for substitution of lightweight materials in the transportation sector. Included are data on energy conversion efficiency of the engine and its relationship to vehicle weight, the capital stock, the amount of energy used, and the service activity level as measured in ton-miles. DOE

N85-13975# Oxford Univ. (England). Dept. of Engineering Science.
SELF-TUNING CONTROLLER DESIGN AND IMPLEMENTATION
D. W. Clarke Jan. 1984 30 p refs
(OUEL-1535/84) Avail: NTIS HC A03/MF A01

The discretization of the continuous-time plant with respect to the location of the discrete-time zeros of the transfer function and to possible models of typical load-disturbances is described. The general theory of predictive control is shown to have interpretations as Smith predictive, detunable model-reference, and generalized minimum variance laws. Extensions to include feedforward compensation for known disturbances are provided. The pole-placement method is derived to cover the servo and the regulator problem, and in the latter case it is shown that a simple estimation algorithm is sufficient. General recursive estimation methods based on minimizing the prediction error are discussed, particularly numerically stable versions of the recursive least squares method. A simple self-tuner is provided as a combination of an estimator and a basic control law, and the outline of the corresponding program given. Applications of self-tuning are summarized. Author (ESA)

N85-13976# Oxford Univ. (England). Dept. of Engineering Science.
A GENERALIZED LQG APPROACH TO SELF-TUNING CONTROL. PART 1: ASPECTS OF DESIGN. PART 2: IMPLEMENTATION AND SIMULATION
D. W. Clarke, P. P. Kanjilal, and C. Mohtadi 1984 67 p refs Sponsored by UK Science and Engineering Research Council (OUEL-1536/84) Avail: NTIS HC A04/MF A01

An explicit method based on minimization of a multistage cost-function and a Controlled Autoregressive Integrated Moving Average plant model formulated in state-space in presented. The method extends the design features of the Generalized Minimum Variance scheme to the multistage case; these can be used to tailor the closed-loop response of the system. The approach is shown to be robust against wrong a priori assumptions made about the plant dead-time or order, thus maintaining good servo and disturbance rejection properties. Author (ESA)

N85-13869*# General Electric Co., Philadelphia, Pa. Space Systems Div.
FLYWHEEL CONTAINMENT AND SAFETY CONSIDERATIONS
Anthony P. Coppa *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 243-264 refs Sponsored in part by DOE (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 13B

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-13977 Polish Academy of Sciences, Warsaw. Pracownia Fonetyki Akustycnej.
TESTS OF THE AUTOMATIC RECOGNITION OF WORDS SPOKEN BY DIFFERENT VOICES BASED ON COLLECTED GROUPS OF MODEL BINARY SPECTROGRAMS [PROBY AUTOMATYCZNEGO ROZPOZNAWANIA WYRAZOW WYMAWIANYCH PRZEZ ROZNE GLOSY W OPARCIU O GRUPOWE ZBIORY WZORCOWYCH SPEKTROGRAMOW BINARNYCH]
Henryk Kubzdela 1983 19 p refs In POLISH (ISSN-0208-5658) Copyright. Avail: Issuing Activity

A modified model for the automatic recognition of speech based on binary spectrograms in described and tested. The model employs both a 100-term dictionary and a 26-word dictionary. The findings indicate that automatic recognition of words spoken by different voices based on collected groups of standard binary spectrograms using the proposed modified model is successful only with certain types of voices. Thus, the proposed modification does not assure the desired unification of binary spectrographic images of a given word for a certain broad group of speakers. The implications of the findings are discussed. Transl. by B.G.

N85-13978 Stanford Univ., Calif.
THE ADAPTIVE SPECTRUM ANALYSER Ph.D. Thesis
Philippe Andre Baudrenghien 1984 287 p
Avail: Univ. Microfilms Order No. DA8420488

A new method for the analysis of signals whose power spectral density is located in a set of narrow bands (NB) on the frequency axis is introduced. The adaptive spectrum analyzer (ASA) models the NB signal as a linear combination of sinusoids. The amplitudes, phases, and frequencies of these sinusoids are estimated in order to minimize the mean square of the error of fit between the model's output and the data. It is shown that the ASA achieves very fine frequency resolution. When the signal consists of a sinusoid buried in white noise, the ASA outperforms the Periodogram for the estimation of the sinusoid's frequency. The ASA can also be used for adaptive line enhancement. The major problem of this method is that convergence is not completely global. When the signal contains several sinusoids (or narrow spectral bands), the ASA may need a decent initial estimate of the sinusoids frequencies as a starting point for adaptation. Dissert. Abstr.

N85-13979# Committee on Science and Technology (U. S. House).
SUBLIMINAL COMMUNICATION TECHNOLOGY
Washington GPO 1984 297 p refs Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2d Congr., no. 105, 6 Aug. 1984 (GPO-38-833) Avail: Subcommittee on Transportation, Aviation and Materials

Various types of subliminal communication devices presently in use, the psychological basis for subliminal technology, and the effectiveness of subliminal communication for therapy are examined as well as potentials for abuse. Social, legal, and ethical aspects are considered with respect to the privacy and autonomy of captive audiences. Implications for the regulation of subliminal techniques are reviewed with application to the various media. A.R.H.

N85-13980*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Jul. - Sep. 1984
E. C. Posner, ed. 15 Nov. 1984 193 p refs (NASA-CR-174149; JPL-TDA-PR-42-79; NAS 1.26:174149) Avail: NTIS HC A09/MF A01 CSCL 17B

Tracking and ground-based navigation; communications, spacecraft-ground; station control and system technology; capabilities for new projects; networks consolidation program; and network sustaining are described. For individual titles, see N85-13981 through N85-13998.

N85-13981*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUBMILLIARCSECOND VLBI USING COMPACT CLOSE PAIRS OF RADIO SOURCES: ERROR ANALYSIS
D. D. Morabito *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 1-16 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The potential accuracy attainable for (delta) VLBI positional measurements (submilliarc second level) is reached by simultaneously observing pairs of compact radio sources whose angular separation are smaller than the beamwidth of each antenna. Simultaneous (delta) VLBI (SVLBI) enables significant cancellation of measurement errors. Solar plasma is the dominant fluctuating error source in SVLBI positional measurements since there is enhanced cancellation of the troposphere and ionosphere, and complete cancellation of oscillator instabilities. Of the nonfluctuating error sources, errors due to universal time predominate. By performing SVLBI experiments over several years with many different close pairs of radio sources, limits can be placed on reference frame stability. Intrinsic properties of the sources, such as source structure and proper motion, will limit measurements. The SVLBI differential phase and corruptive noise sources will be discussed here along with estimated results. Author

N85-13982*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ON ESTIMATING THE PHASE OF PERIODIC WAVEFORM IN ADDITIVE GAUSSIAN NOISE, PART 2
L. L. Rauch *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 17-24 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

Motivated by advances in signal processing technology that support more complex algorithms, a new look is taken at the problem of estimating the phase and other parameters of a periodic waveform in additive Gaussian noise. The general problem was introduced and the maximum a posteriori probability criterion with signal space interpretation was used to obtain the structures of optimum and some suboptimum phase estimators for known constant frequency and unknown constant phase with an a priori distribution. Optimal algorithms are obtained for some cases where the frequency is a parameterized function of time with the unknown parameters and phase having a joint a priori distribution. In the last section, the intrinsic and extrinsic geometry of hypersurfaces is introduced to provide insight to the estimation problem for the small noise and large noise cases. Author

N85-13983*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VLBI SOLUTIONS FOR THE TIME VARIATION OF DSN BASELINES: 1978 - 1983
R. N. Treuhaft, J. L. Fanselow, K. M. Liewer, A. E. Niell, O. J. Sovers, J. B. Thomas, and K. S. Wallace *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 25-34 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Very Long Baseline Interferometry (VLBI) results are presented for the two baseline sectors between the Goldstone DSN antenna complex and the overseas sites at Canberra, Australia and Madrid, Spain. Results from solutions using data taken between 1978 September and 1983 May show an apparent California-Spain baseline length increase of 21 cm during this time span, while the California-Australia length has remained constant. Statistical investigations of the integrity of the data are discussed along with dominant systematic error sources and their effect on baseline length determination. Results and interpretation of the time behavior of the angle between DSN baselines are also described. Author

N85-13984*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE PERFORMANCE OF DIFFERENTIAL VLBI DELAY DURING INTERPLANETARY CRUISE
B. Moultrie, P. J. Wolff, and T. H. Taylor *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 35-46 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Project Voyager radio metric data are used to evaluate the orbit determination utilities of several data strategies during spacecraft interplanetary cruise. Benchmark performance is established with an operational data strategy of conventional coherent Doppler, coherent range, and explicitly differenced range data from two intercontinental baselines to ameliorate the low declination singularity of the Doppler data. Employing a Voyager operations trajectory as a reference, the performance of the operational data strategy is compared to the performances of data strategies using differential VLBI delay data (spacecraft delay minus quasar delay) in combination with the aforementioned conventional data types. The comparison of strategy performances indicates that high accuracy cruise orbit determination can be achieved with a data strategy employing differential VLBI delay data, where the quantity of coherent radio metric data was reduced by over 95% with a concurrent 90% reduction in the DSN time allocated to radio metric data acquisition. Author

N85-13985*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT AND TESTING OF A 20-KW X-BAND TRANSMITTER WITH HIGH PHASE STABILITY
R. Cormier and T. Tesarek *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 47-61 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

A new 20-kW X-band transmitter was built and installed on the antenna at DSS 13. A description of the hardware and operation are presented. This transmitter is the prototype for the new X-band uplink to be added to the DSN to support Galileo and future missions. Author

N85-13986*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUPERCONDUCTING NbTi AND Pb(Cu) BANDPASS FILTERS c33
J. J. Bautista and S. M. Petty *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 62-68 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

Superconducting Nb0.45Ti0.55 and Pb electroplated on Cu bandpass microwave filtes were constructed to investigate their low loss properties at 4.7 K. An interdigital stripline filter configuration was selected as the optimum structure for future applications. The filter was designed to operate at 8.45 GHz with an equal ripple bandwidth of 0.15 GHz. The insertion loss and the noise temperature contribution were measured at 4.7 K. In addition, the insertion loss was studied as a function of out of band power (up to 1 watt) and temperature (4.7 K up to T(c)). Results of an oxygen free high conductivity Cu filter are included for comparison. Author

N85-13987*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AVALANCHE PHOTODIODE STATISTICS IN TRIGGERED-AVALANCHE DETECTION MODE c33
H. H. Tan *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 69-80 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

The output of a triggered avalanche mode avalanche photodiode is modeled as Poisson distributed primary avalanche events plus conditionally Poisson distributed trapped carrier induced secondary events. The moment generating function as well as the mean and variance of the diode output statistics are derived. The dispersion of the output statistics is shown to always exceed that of the Poisson distribution. Several examples are considered in detail. Author

N85-13988*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESIGN AND PERFORMANCE OF SAMPLED DATA LOOPS FOR SUBCARRIER AND CARRIER TRACKING
S. Aguirre and W. J. Hurd *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 81-95 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Design parameters and resulting performance are presented for the sampled data analogies of continuous time phase locked loops of second and third order containing perfect integrators. Expressions for noise equivalent bandwidth and steady state errors are given. Stability and gain margin are investigated using z plane root loci. Finally, an application is presented for Voyager subcarrier and carrier tracking under the dynamics of the encounters with Uranus and Neptune. For carrier tracking, loop bandwidth narrow enough for satisfactory loop signal to noise ratios can be achieved using third order loops without rate aiding, whereas second order loops would require aiding. For subcarrier tracking, third order loops can be used when the sampling rate is limited to approximately once per second, as in the Baseband Assembly, whereas second order loops sufficiently wide to track the dynamics have stability problems at that sampling rate. Author

N85-13989*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVED CARRIER TRACKING BY SMOOTHING ESTIMATORS **c33**
C. A. Pomalaza Raez and W. J. Hurd *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 96-106 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

Smoothing as a way to improve the carrier phase estimation is proposed and analyzed. The performance of first and second order Kalman optimum smoothers are investigated. This performance is evaluated in terms of steady state covariance error computation, dynamic tracking, and noise response. It is shown that with practical amounts of memory, a second order smoother can have a position error due to an acceleration or jerk step input less than any prescribed maximum. As an example of importance to the NASA Deep Space Network, a second order smoother can be used to track the Voyager spacecraft at Uranus and Neptune encounters with significantly better performance than a second order phase locked loop. Author

N85-13990*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS OF A CODED, M-ARY ORTHOGONAL INPUT OPTICAL CHANNEL WITH RANDOM-GAIN PHOTOMULTIPLIER DETECTION
P. J. Lee *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 107-113 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Performance of two coding systems is analyzed for a noisy optical channel with M(=2(L)-ary orthogonal signaling and random gain photomultiplier detection. The considered coding systems are the Reed Solomon (RS) coding with error only correction decoding and the interleaved binary convolutional system with soft decision Viterbi decoding. The required average number of received signal photons per information bit, N sub b, for a desired bit error of 0.000001 is found for a set of commonly used parameters and with a high background noise level. We find that the interleaved binary convolutional coding system is preferable to the RS coding system in performance complexity tradeoffs. Author

N85-13991*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A VERY EFFICIENT TRANSFER FUNCTION BOUNDING TECHNIQUE ON BIT ERROR RATE FOR VITERBI DECODED, RATE 1/N CONVOLUTIONAL CODES **c64**
P. J. Lee *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 114-123 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 12A

For rate 1/N convolutional codes, a recursive algorithm for finding the transfer function bound on bit error rate (BER) at the output of a Viterbi decoder is described. This technique is very fast and requires very little storage since all the unnecessary operations are eliminated. Using this technique, we find and plot bounds on the BER performance of known codes of rate 1/2 with $K < 18$, rate 1/3 with $K < 14$. When more than one reported code with the same parameter is known, we select the code that minimizes the required signal to noise ratio for a desired bit error rate of 0.000001. This criterion of determining goodness of a code had previously been found to be more useful than the maximum free distance criterion and was used in the code search procedures of very short constraint length codes. This very efficient technique can also be used for searches of longer constraint length codes. Author

N85-13992*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEQUENTIAL SYNDROME DECODING OF CONVOLUTIONAL CODES **c64**
I. S. Reed and T. K. Truong *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 124-135 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 12A

The algebraic structure of convolutional codes are reviewed and sequential syndrome decoding is applied to those codes. These concepts are then used to realize by example actual sequential decoding, using the stack algorithm. The Fano metric for use in sequential decoding is modified so that it can be utilized to sequentially find the minimum weight error sequence. Author

N85-13993*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VLSI ARCHITECTURES FOR THE MULTIPLICATION OF INTEGERS MODULO A FERMAT NUMBER **c64**
J. J. Chang, T. K. Truong, I. S. Reed, and I. S. Hsu *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 136-141 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 12A

Multiplication is central in the implementation of Fermat number transforms and other residue number algorithms. There is need for a good multiplication algorithm that can be realized easily on a very large scale integration (VLSI) chip. The Leibowitz multiplier is modified to realize multiplication in the ring of integers modulo a Fermat number. This new algorithm requires only a sequence of cyclic shifts and additions. The designs developed for this new multiplier are regular, simple, expandable, and, therefore, suitable for VLSI implementation. R.J.F.

N85-13994*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROGRAMMABLE DIGITAL BAUD INTEGRATORS FOR THE RADAR HIGH-SPEED DATA ACQUISITION SYSTEM **c60**
K. H. Farazian and R. F. Jurgens *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 142-151 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09B

An all-digital technique for the Baud Integrators of the Radar High-Speed Data Acquisition system, a technique that avoids the inherent problems associated with analog systems such as the need for calibration and adjustment is described. The integration period of this system is selectable in 100-ns steps from 100 ns to 3276700 ns. R.J.F.

N85-13995*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARK IVA DSN 26-METER SUBNET
D. D. Gordon *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 152-159 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The Office of Space Tracking and Data Systems' Networks Consolidation Program (NCP), managed by the Jet Propulsion Laboratory (JPL), includes the implementation of a 26-meter Tracking and Communications Subnet as a part of the Mark IV A Deep Space Network (DSN). The incorporatin of this subnet into the DSN will contribute to the NCP goal of consolidating the two NASA ground tracking networks into one tracking network. The 26-meter Tracking and Communication Subnet was designed to provide the capability to support, at each Deep Space Communication Complex, the tracking and data communication requirements of the earth-orbital missions that cannot be supported by the Tracking and Data Relay Satellite System when it becomes operational. Implementation activities and planned capabilities of the subnet are discussed. R.J.F.

N85-13996*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
64-METER TO 70-METER ANTENNA EXTENSION
D. H. McClure and F. D. McLaughlin *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 160-164 (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

The Deep Space Network 64-m antennas are being upgraded to improve their performance by increasing the diameter to 70 m,

installing precision panels, and using a shaped surface. Performance improvement is expected to be 1.9 dB at X-band and 1.4 dB at S-band. The design and capabilities of the antenna are discussed. R.J.F.

N85-13997*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTENNA MICROWAVE SUBSYSTEM
P. L. Parsons *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 165-171 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

The Deep Space Net consists of 64-m, 34-m, and 26-m antennas, each with its own characteristics. The changes that are being made to each under the Mark IV program and additions required for some special spacecraft projects are discussed. R.J.F.

N85-13998*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VLBI SYSTEM (BLK I) IF-VIDEO DOWN CONVERSION DESIGN
N. C. Ham *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 172-188 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The prototype intermediate frequency video down converter of the Deep Space Network (BLK 1) Very Long Base Interferometry system, a hybrid of analog and digital circuits, was completed and tested. The initial results met all design specifications, establishing a milestone in new design technology for such devices. This device has uses in other similar applications and can form the basis for expanded design and applications. R.J.F.

N85-13999# European Space Conference, Paris (France).
WORKSHOP ON MECHANICAL TECHNOLOGY FOR ANTENNAS
T. D. Guyenne, ed. and J. J. Hunt, ed. Sep. 1984 180 p refs Worshop held at Noordwijk, Netherlands, 26-28 Jun. 1984
(ESA-SP-225; ISSN-0379-6566) Avail: NTIS HC A09/MF A01

Deployable/furlable antennas; inflatable antennas; antenna design; antenna testing; and spacecraft structures/antenna control system interactions were discussed. For individual titles, see N85-14000 through N85-14022.

N85-14000# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Structures and Configuration Section.
ANTENNA MECHANICAL TECHNOLOGIES WITHIN ESA
G. G. Reibaldi *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 3-10 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

Spaceborne antenna technologies for telecommunication, remote sensing and scientific missions are reviewed. Solid, deployable, furlable and inflatable reflectors are described. Antenna technology support concepts in materials, analysis, testing, manufacturing, mechanisms and attitude control system/structures coupling are presented. The need for technology commonality between different requirements is stressed. An ESA technology flight demonstration program is summarized. Author (ESA)

N85-14001# Astro Research Corp., Carpinteria, Calif.
HIGH PERFORMANCE DEPLOYABLE ANTENNA STRUCTURES
J. M. Hedgepeth *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 13-18 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

Design requirements of large, deployable, spaceborne antennas are discussed. The deployable structures used for the Solar Maximum Mission Satellite high gain antenna, and the SEASAT SAR array are described. A tetrahedral truss structure for antennas requiring high dimensional precision at low cost is proposed. Author (ESA)

N85-14002# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
OFFSET UNFURLABLE ANTENNA CONCEPTS
H. Kellermeier, W. Schaefer, and H. Vorbrugg *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 19-25 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

A design definition study for an unfurlable offset antenna applicable to a wide mission spectrum of communication satellites was carried out. A radial rib reflector concept with auxiliary adjustment ribs, and a three dimensional scissors truss concept were considered. The radial rib reflector is seen to provide the greatest versatility. The foldable ribs can be deployed and latched up by redundant cables driven by a central electric drive unit. The design has a built-in retraction capability. Author (ESA)

N85-14003# Cambridge Univ. (England).
THE UK AND NETHERLANDS MILLIMETRE-WAVE TELESCOPE c89
R. E. Hills *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 29-30 Sponsored by UK Science and Engineering Research Council (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

The design of a 15 m diameter antenna for astronomical observations at millimeter and submillimeter wavelengths is outlined. Features required to achieve extremely high surface accuracy and precise pointing are described. The state of the construction program is reported. Author (ESA)

N85-14004# Contraves Corp., Zurich (Switzerland).
LARGE SPACEBORNE ANTENNA REFLECTORS USING INFLATABLE SPACE RIGIDIZED STRUCTURES
M. C. Bernasconi *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 31-36 refs Sponsored by ESA (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

Center and offset fed reflectors for space applications were studied. Stiffness and temperature distribution of scale models of a 10 m inflatable reflector were examined. A feasibility study of a 20 m reflector for the QUASAT very long baseline interferometry mission was performed. A manufacturing concept for a large offset antenna was developed. The studies indicate that large inflatable antennas with good performance, high stiffness (3.17 Hz lowest frequency at 20 m aperture) and thermal stability (0.4 mm rms worst case at 20 m aperture) are feasible. Manufacturing accuracy and packaging efficiency can be achieved at low cost. Author (ESA)

N85-14005# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
DISTORTIONAL MEASUREMENT OF ANTENNAS UNDER SPACE SIMULATION CONDITIONS BY MEANS OF HOLOGRAPHY
H. U. Frey *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 37-40 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

The K-band west spot beam reflector of a telecommunication satellite was successfully tested by double exposure holographic interferometry. A distortion of 140 microns + or - 5 microns is measured during the cooldown from minus 10 to minus 120 C. Measurements were also performed for out-of-eclipse case and half shadow of the antenna. The test method, the test set up and the constraints of the space simulation facility are described. Author (ESA)

N85-14006# TICRA ApS, Copenhagen (Denmark).
ELECTRICAL CONSEQUENCES OF MECHANICAL ANTENNA CHARACTERISTICS
K. Pontoppidan *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 41-47 ref (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

Reflector antenna surface distortion errors that lead to a best fit paraboloid, and additional random and systematic errors were investigated. It is demonstrated that the influence of each type of error is very different in magnitude as well as in the spatial distribution. It is also shown that not only the peak gain but also the sidelobe requirement play a decisive role when the acceptable surface accuracy is to be established. Author (ESA)

N85-14007# National Space Development Agency, Ibaraki (Japan). Space Center.
STRUCTURAL ASPECTS OF SAR ANTENNA FOR JAPANESE EARTH RESOURCES SATELLITE 1
H. Mitsuma *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 53-58 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

Research and development to establish the basic technology of Synthetic Aperture Radar (SAR) for the Japanese Earth Resources Satellite-1 are described. The solar array paddle technologies (honeycomb sandwich panel and deployment mechanism) were applied to the SAR antenna. Structural and mechanical component tests, and thermal distortion tests are discussed. Author (ESA)

N85-14008# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
TECHNOLOGY FOR THE ERS-1 SAR ANTENNA
R. Wagner *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 59-66 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

The metallization of CFRP waveguides, the Deployable Truss Structure (DTS) and verification in terrestrial environment of the 10 x 1 m SAR antenna of ERS-1 (ESA satellite) are discussed. Waveguide metallization was achieved indirectly with metallization of the mandrel prior to CFRP lay-up, and directly, by electroplating of manufactured CFRP components. Both techniques proved unsatisfactory, but a surface treatment applied to the metal layer in the indirect technique improves adhesion strength by an order of magnitude, and enables the waveguides to meet requirements. The DTS satisfies launch, deployment, and inflight specifications for a 5 panel/2 wing structure. Ground tests include analytical simulation of deployment with and without gravity effects, and a gravity compensation technique for tests. Author (ESA)

N85-14009# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
MECHANICAL/THERMAL DESIGN OF A POLARIZATION SENSITIVE REFLECTOR
H. J. Huettmann, T. Fischer, H. Popp, and W. Schaefer *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 67-72 refs (For primary document see N85-13999 05-32)
(Contract ESTEC-5494/84/NL-GM)
Avail: NTIS HC A09/MF A01

Mechanical/thermal design features of a reflector for frequency reuse by orthogonal polarization are outlined. The reflector configuration consists of two Kevlar fiber sandwich shells oriented one behind the other and joined by a Kevlar fiber ring. The reflector shell surfaces are covered with conductive strip grids which are oriented perpendicularly with respect to each other. Further stiffening can be achieved by four ribs. The preferred thermal design has a Sun shield in front of the reflector and multilayer insulation on its rearside. Author (ESA)

N85-14010# Construcciones Aeronauticas S.A., Madrid (Spain). Space Div.
CASA TECHNOLOGICAL EFFORT IN THE FIELD OF ANTENNAS
M. A. Llorca *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 73-75 (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

Shaped reflector and waveguide array antennas for ESA projects were developed. The wind scatterometer antenna for ERS-1 (ESA satellite) is described. This is a three beam concept consisting of a fixed antenna on top of the synthetic aperture radar, and two deployable, but rigid, antennas situated at either side of the payload. Author (ESA)

N85-14011# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
BAe ANTENNA HARDWARE TECHNOLOGY FOR CURRENT SATELLITE PROJECTS
R. K. Emery *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 77-82 (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

The mechanical design, development and manufacture of antenna hardware for satellite solid reflectors up to 3.2m diameter, feed chains, antenna pointing mechanisms, antenna deployment subsystems, and antenna support structures are discussed. The technology involved and problems encountered are summarized. Author (ESA)

N85-14012# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
TECHNOLOGY AND PERFORMANCES OF STRUCTURAL THERMAL MECHANICAL EQUIPMENT USED FOR ANTENNA OF TV.SAT-TDF 1 PROGRAM
G. Morio, B. Verez, J. Nesa, J. L. Pettex, S. Aucel, and H. Dageville *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 83-91 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

The mechanical-thermal technologies of the TV SAT-TDF 1 antenna module are described. The module is housed in a tower structure, with 2 reflectors (Tx at 12 GHz, Rx at 18 GHz); 2 antenna fine pointing mechanisms with their associated electonics; 2 reflector folding and release mechanisms; 2 reflector deployment and locking mechanisms; and thermal control equipment. Criteria assumed to satisfy antenna payload (commonality, AM orientation, reflectors folding according to the fairing volume, folding and kinematic constraints) are described. Thermal control concepts, analysis, performances, and alignment techniques are summarized. Author (ESA)

N85-14013# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. for Structural Mechanics.
INFLUENCE OF THERMAL CYCLING ON THE BEHAVIOR OF CFRP MATERIAL FOR SPACE STRUCTURES c27
W. Hartung *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 97-101 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

The effects of a simulated 10 yr service in geosynchronous orbit on the thermomechanical properties of graphite/fiber composite structures were tested. Materials were exposed to 3500 thermal cycles with a temperature range from minus 160 to +100 C. The influence of microcracking increases mainly during the first 1000 thermal cycles. Strength reduction corresponds to the amount of microcracking. It is slight for epoxy-based laminates (3% to 22%). Polyimide based material suffers strength reduction of > 40%. The percentage of stiffness degradation at the end of the test is nearly equal to that of strength. A slight increase of thermal expansion at the end of thermal cycling reflects increased influence of the matrix due to fiber matrix debonding. Poor resistance of polyimide resin against thermal cycling is caused by the too small strain at failure combined with the high curing temperature, resulting in a higher prestress at operating temperatures. Author (ESA)

N85-14014# Rome Univ. (Italy). Dipt. Aerospaziale.
THE DIMENSIONAL STABILITY OF ADVANCED COMPOSITE ANTENNA REFLECTORS: ANALYTICAL AND TEST EVALUATION c24
M. Marchetti and F. Morganti (Selenia S.p.A., Rome) *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 103-109 refs (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

The effects of thermal expansion coefficient of the graphite-epoxy structure, thermal cycling which the structure undergoes at ground and in orbit, and moisture sorption of the dimensional stability of a 4 m diameter reflector 20 to 30 GHz spacecraft antenna were tested. A finite element model to predict thermal expansion coefficients (TEC) in sandwich panels was developed. Tests suggest that artificial thermal aging helps to stabilize the TEC value of graphite-epoxy composites, compensating ground environment effects, such as moisture, and reducing settling and creep effects in-orbit. Author (ESA)

N85-14015# Construcciones Aeronauticas S.A., Madrid (Spain). Space Div.

CASA ACTIVITIES IN ANTENNA TECHNOLOGY

M. deCastroNodal *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 111-116 (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

The technology required to manufacture molded solid reflectors from composite materials for spaceborne applications is outlined. An 11 to 14 GHz circular polarization double offset reflector with 2.3 x 3.1 m aperture was designed. The reflector dish is a CFRP covered aluminum honeycomb core sandwich, interfacing through 12 fixation points with the truss support structure. The design is also used as a basis for Olympus TVB1 satellite reflectors. Materials selection and surface coatings for reflectors in the 100 to 300 GHz range are discussed. Author (ESA)

N85-14016# Saab-Scania, Linkoping (Sweden).

STRUCTURAL DESIGN AND THERMAL STABILITY OF TELE-X ANTENNA TOWER c39

B. Moertberg *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 117-120 (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

The design, analysis and manufacturing of the TELE-X satellite antenna tower are described. The tower has to sustain loads during launch and in-orbit deployments, fulfill stiffness requirements, fulfill environmental requirements with respect to other subsystems, and fulfill thermal distortion requirements. The antenna system is based on a Cassegrain design consisting of a feed, subreflector and main reflector. The structure can withstand temperature gradients of 25 C between structural elements, and 70 C between upper and lower platform. Author (ESA)

N85-14017# Rome Univ. (Italy). Dept. of Aerospace.

ANALYTICAL THERMAL FORMULATIONS FOR ANTENNA DISHES

C. Arduini *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 125-131 refs (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

Thermostructural analysis of spaceborne antenna dishes using interactive thermal-structural-control unified analytical formulations is discussed. Displacement and temperature are represented by a Taylor series. Results which describe how antenna dishes can be thermally analyzed under general hypotheses by a completely analytical radiative-conductive formulation are shown. Author (ESA)

N85-14018# Rome Univ. (Italy).

IN-ORBIT PERFORMANCE OF INTELSAT V COMMUNICATIONS ANTENNAE DEPLOYMENT SYSTEMS

N. Lomas *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 133-139 (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

The INTELSAT hinged antenna deployment system is described, and use of real time telemetry from spacecraft sensors to evaluate the success of the deployments, and the actions taken to correct performance anomalies are discussed. Two partial failures were successfully diagnosed using the telemetry from nutation accelerometers and Sun and Earth sensors. Both anomalies arose from conditions where initial clearances in the mechanism were too small to accommodate the thermal distortions encountered in orbit. A large increase in the friction torque resulted, which was beyond the capacity of the springs to overcome until temperatures moderated. Thermal distortion effects were accounted for in the hinge design, the clearances were correctly adjusted at final assembly and reverified by an inspection and test program, so INTELSAT 5 overcame deployment problems. Author (ESA)

N85-14019# Rome Univ. (Italy). Dipt. Aerospaziale.

ELASTIC DISPERSION EFFECTS ON DYNAMICS AND CONTROL OF LARGE MODULAR ANTENNAS c39

F. Graziani, S. Sgubini, and A. Agneni *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 141-146 refs (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

The dispersion equation and the steady state harmonic response of a modular structure were analyzed to study elastic effects such as distortion and filtering on large space antennas. The relations between the wave numbers and the frequencies were examined. Due to the strong nonlinearity of these relations, phase velocity strongly depends on frequency, so that each harmonic of a wave packet travels with a different speed: the packet shape disperses during the propagation (distortion effect). The relations can be linearized, yielding a nondispersive behavior, but only for very small wave numbers. Being the eigenvalues related to the wave numbers, the natural frequencies (all belonging to the dispersion curves) tend to congregate (clustering effect). Gaps in the frequency range (stopping bands) for which no frequency corresponds to real wave number, do not allow propagation in these bands (filtering effect). Author (ESA)

N85-14020# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

STUDY OF STRUCTURE CONTROL DYNAMIC INTERACTION FOR RADIO FREQUENCY ANTENNA CONTROL SYSTEMS

D. Muzi *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 147-152 refs (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

Dynamic interaction between spacecraft flexible structural elements and control systems was investigated for a telecommunication satellite configuration. Nonlinear time simulations of N/S stationkeeping maneuvers were performed to assess the impact of antenna inertia and flexible modes on the main body attitude control system. Simulations were performed using the Dynamic and Control Analysis Package (DCAP), for antennas with diameters of 1.6 and 4.0 m. The DCAP results indicate satisfactory performance for the main body and antenna pointing control loop for a small antenna structure with low mass and inertia. For large antennas, antenna pointing mechanism stepping can make the antenna-satellite system unstable. Author (ESA)

N85-14021# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).

HEMISPHERICAL ANTENNA POINTING MECHANISM c37

W. Auer and H. Schulz *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 153-157 (For primary document see N85-13999 05-32)

Avail: NTIS HC A09/MF A01

A hemispherical pointing mechanism, including its drive and control electronics, was designed for spaceborne payloads of up to 30 kg, and 1 arcmin pointing accuracy. It has 2 axes with a 45 deg (or higher) angle between them for hemispherical coverage. Around the azimuth, a first member, which has a provision to turn a second member around an axis which is 45 deg inclined can be rotated. A rotation around the latter axis changes elevation and azimuth. The same elevation angle can be generated with an equally positive or negative rotational angle from the basic position, but with associated different azimuth angles. This ambiguity can

be easily resolved by allowing only, for instance, positive rotation between 0 and 90 deg. Author (ESA)

N85-14022# Societe Nationale Industrielle Aerospatiale, Cannes (France).
ARABSAT SPACECRAFT: RX AND TX ANTENNA MECHANISMS c37
C. Long and C. Vidal *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 159-167 (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

A receive antenna (Rx at 6 GHz) and transmit antenna (Tx at 4 GHz) were developed for the Arabsat communication satellite. The Rx antenna has a single hinge line and during launch the reflector dish is restrained against the antiearth panel by two hold-down points. Deployment is actuated by springs and regulated by a centrifugal regulator. The Rx antenna mechanisms consist of two motorized rods, hinged on the structure; a driving rod ensuring the required lateral stiffness to the mechanisms in deployed configuration; a centrifugal regulator on the motorized rod; two hold-down points ensured by two pyrotechnical separation nuts; and a latch on each motorized rod to block the reflector in the deployed configuration. The position of the Tx antenna in stowed and deployed configuration requires double hinge lines. A coupling rod conjugates the rotation of the double hinge line to allow actuation on only one hinge line, and control deployment rate with only one centrifugal regulator. Author (ESA)

N85-14023# Department of the Navy, Washington, D. C.
METALLIZED SYNTHETIC CABLE Patent Application
T. E. Jones, inventor (to Navy) Filed 18 Apr. 1984 23 p
(AD-D011263; US-Patent-Appl-SN-601751) Avail: NTIS HC A02/MF A01 CSCL 17/2

The present invention is directed to providing a method of fabricating an essentially neutrally buoyant undersea data communications link and a suitable apparatus therefor. At least one continuous synthetic fiber is provided having a diameter of between eight and ten microns, a weight of between 1.75 and 2.2 grams per cubic centimeter and a tensile strength in the range of 200,000 to 400,000 lbs/sq. in. Coating each continuous fiber with a metallized layer to a one to three micron thickness provides the low resistance data pathway. A dielectric insulation covers the coated fibers, protects them and insulates them from the surrounding seawater which can function as an electrical return path or a metal sheath is provided on the outside of the dielectric insulation for that purpose. A prime object of the invention is to provide an improved data transmission cable. GRA

N85-14024# Department of the Air Force, Washington, D.C.
ADAPTIVE MUTUAL INTERFERENCE SUPPRESSION METHOD Patent Application
B. N. ODonnell, inventor (to Air Force) Filed 26 Jun. 1984 27 p
(AD-D011268; US-Patent-Appl-SN-624568) Avail: NTIS HC A03/MF A01 CSCL 17/9

A method is described which provides automatic self synchronization (in time) between multiple pulse repetition frequency (PRF), pulse Doppler radars. The synchronization technique time aligns data within a coherent look transmission (a group of pulses - typically milliseconds). This technique substantially eliminates sensitivity losses associated with blanking false alarms or detection from interfering radars transmitting (in time) at pulse repetition intervals (PRI) different than the host radar. An implementation of this method for a 2 PRF radar waveform is described although the technique may be extended to more than 2 PRF's. The technique provides an alternative approach to pulse shaping or multiple (different) frequencies to control MI but may be used in conjunction with these techniques to minimize sensitivity losses due to interference blanking. GRA

N85-14025# Department of the Navy, Washington, D. C.
TEST SIGNAL GENERATOR FOR COHERENT AIR-TO-GROUND RADARS Patent Application
R. A. Guhse, inventor (to Navy) Filed 23 Dec. 1983 14 p
(AD-D011278; US-Patent-Appl-SN-564864) Avail: NTIS HC A02/MF A01 CSCL 17/9

A test signal generator for on the ground testing of coherent air-to-ground radars has a rotating antenna for simulating aircraft motion when receiving return radar signals. An angular position sensor provides a signal which is proportional to the angular position of the rotating antenna. Correlation of these signals in the radar computer provides a radar test signal having realistic amplitude and Doppler histories. Author (GRA)

N85-14026# Department of the Air Force, Washington, D.C.
PHASE ONLY ADAPTIVE NULLING IN A MONOPULSE ANTENNA Patent Application
R. L. Haupt, inventor (to Air Force) Filed 11 Jul. 1984 30 p
(AD-D011289; US-Patent-Appl-SN-629926) Avail: NTIS HC A03/MF A01 CSCL 17/9

A monopulse radar having a single set of phase shifters shared by both sum and difference channels is described. The radar utilizes an algorithm that effects simultaneous nulling in the sum and difference patterns of its phased array antenna. An algorithm is developed for phase-only nulling which does not require knowledge of the location of interference sources. Author (GRA)

N85-14027# European Space Agency, Paris (France).
BASIC INVESTIGATION CONCERNING THE APPLICABILITY OF MULTISPECTRAL RADIATION DATA FROM MICROWAVE RADIOMETRY MEASUREMENTS TO GEOSCIENTIFIC OBJECTIVES OF REMOTE SENSING
Rudolf H. Dittel Sep. 1984 422 p refs Transl. into ENGLISH of "Grundlegende Untersuch. zur Verwendbarkeit multispektrale Strahlungsinform. aus Mikrowellen-Radiometrie-Mess. fuer erdwiss. Aufgabenstellungen der Fernerkund', DFVLR, Oberpfaffenhofen, West Germany Rept. DFVLR-FB-83-27, 1983 Original language document was announced as N84-20000
(ESA-TT-846; DFVLR-FB-83-27) Avail: NTIS HC A18/MF A01; original German version available from DFVLR, Cologne DM 95

The applicability of multispectral microwave radiation, detected by radiometric means, to geoscientific objectives of remote sensing was studied. The data characteristics were determined by applying the principles of signal analysis of stochastic events. It is possible to prove the existence of object-related textures and that they are classifiable. The application of data reconstruction methods, using a priori knowledge, improves geometric resolving power by an increase in radiometric contrast, even with disturbed data. Modeling of object-related optical coefficients permits scene contents recorded under different environmental radiation conditions to be compared. Author (ESA)

N85-14028# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
PARAMETRIC MODELS FOR SIGNAL PROCESSING: AUTOREGRESSIVE (AR), MOVING AVERAGE (MA) AND MIXED AUTOREGRESSIVE WITH MOVING AVERAGE (ARMA) [METHODES PARAMETRIQUES EN TRAITEMENT DU SIGNAL: MODELISATIONS AUTOREGRESSIVE (AR), A MOYENNE AJUSTEE (MA) ET MIXTE AUTOREGRESSIVE A MOYENNE AJUSTEE (ARMA)]
Jean-Francois Agnel May 1984 130 p refs In FRENCH Prepared in collaboration avec THOMSON-CSF, Paris
(ENST-84D001; DT.RCM-83/210; ISSN-0751/1345) Avail: NTIS HC A07/MF A01

Parameter estimation of an autoregressive model describing the output signal of an unknown system is studied using correlation methods and covariance methods. The Prony approach based on the Yule-Walker normal equations is considered. Results are generalized for the autoregressive parameter of an ARMA model. Parameter estimation techniques are examined. The maximum likelihood techniques are shown to produce better estimations, but the computer time is larger. Author (ESA)

N85-14264 Fernmeldeamt 3, Munich (West Germany).
TELEPHONING WITH LIGHT AND SUN [TELEFONIEREN MIT

LICHT UND SONNE]
Johann Nussbaum *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 104-107 In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

N85-14654# Joint Publications Research Service, Arlington, Va.
ARTIFICIAL DEFOCUSING LENS IN IONOSPHERE Abstract Only
G. N. Boyko, V. V. Vaskov, S. F. Golyan, A. V. Gurevich, Ya. S. Dimant, V. A. Zyuzin, V. Yu. Kim, G. P. Komrakov, L. A. Lobachevskiy, V. V. Migulin et al *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 12 Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), v. 39, no. 11, 10 Jun. 1984 p 533-536 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-14029# Northeastern Univ., Boston, Mass. Dept. of Physics.
IMPLICATIONS OF THE CHIRAL ANOMALY FOR QUANTUM HALL EFFECT DEVICES
A. Widom, M. H. Friedman, and Y. N. Srivastava Oct. 1984 16 p refs
(NUB-2662) Avail: NTIS HC A02/MF A01

The chiral anomaly equation found by Schinger in quantum electrodynamics is used to derive a relationship between the filling factor (NU) and the Hall conductance on the gate capacitor of a field effect transistor device. In addition, the chiral phase (theta) states are shown to be related to those of the filling factor by /theta> = /2pi nu>. M.G.

N85-14030# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abteilung Elektrizitaet.
SPECIAL DEVELOPMENTS AND METHODS IN HIGH FREQUENCY MEASURING TECHNIQUES [SPEZIELLE ENTWICKLUNGEN UND VERFAHREN DER HOCHFREQUENZMESSTECHNIK]
H. Bayer, ed. Dec. 1983 250 p refs In GERMAN; ENGLISH summary Proc. of 49th PTB Seminar, Brunswick, 7-8 Jun. 1983 (PTB-E-24; ISSN-0341-6674) Avail: NTIS HC A11/MF A01

The status of RF measurements and future trends in research and development are reviewed. Admittance measurements with twin-T devices in the frequency range between 1 and 300 MHz are treated. The improvement of the reflection factor measurement accuracy by a computer is discussed. A thermal noise standard for noise power in the microwave range; calibration of noise power transfer standards, measurement uncertainties and long term stability; and coaxial noise measurement circuits are presented. A computer controlled measuring system for the calibration of HF components is presented. The voltage dependence of the relative ac-dc transfer difference for HF voltage-transfer standards is discussed. The six port measuring technique is explained. A group delay standard for the MHz frequency range, and calibrating and measuring systems for electromagnetic fields are presented. For individual titles, see N85-14031 through N85-14043.

N85-14031# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
PRESENT STATUS AND DEVELOPMENT TENDENCIES IN THE FIELD OF HIGH FREQUENCY MEASURING TECHNIQUES [DERZEITIGER STAND UND ENTWICKLUNGSTENDENZEN IM FACHBEREICH HOCHFREQUENZ-MESSTECHNIK]
H. Bayer *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 3-26 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

The status of RF measurements and future trends in research and development are reviewed. The definition of the basic units of the international system and the uncertainties with which a basic quantity can be related to these units in the best case are reviewed. For tracing RF quantities to the basic units the (Physical-technical Federal Institute) standard measuring devices for RF power, RF voltage, RF attenuation and RF impedance were established, particularly in the frequency range between 100 kHz and 18 GHz. Only in one case (RF power) is the frequency range enlarged to the range from 26.5 GHz to 40.0 GHz. Waveguide noise standards exist in the waveguide X-band between 8.2 GHz and 12.4 GHz. Quantities of the electromagnetic field are measurable between 10 kHz and 3 GHz. Author (ESA)

N85-14032# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
ADMITTANCE MEASUREMENT WITH TWIN-T DEVICES IN THE FREQUENCY RANGE BETWEEN 1 AND 300 MHz [ADMITTANZMESSUNG MIT DOPPEL-T-ANORDNUNGEN IM FREQUENZBEREICH VON 1 MHz BIS 300 MHz]
U. Stumper *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 27-51 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

Design and theory of bridges to measure RF admittances are treated. The coaxial twin-T-admittance measuring device is used to determine precisely the admittance of standard capacitors, inductors and resistors in the RF range 1 to 300 MHz. In contrast to measuring devices derived from low frequency Wheatstone bridge configurations, the twin-T-device has a common earth point for one pole of each of the connectors to the device under test, the RF generator and the null detector, as well as for one pole of each of the two coaxial variable balancing capacitors. The dual measuring device has two symmetrical terminal connectors; this specification is used to determine the bridge factor by a self calibration method, and to increase the measuring range.
Author (ESA)

N85-14033# Siemens A.G., Munich (West Germany).
IMPROVEMENT OF THE ACCURACY OF REFLECTION FACTOR MEASUREMENTS BY A COMPUTER [ERHOEHUNG DER MESSGENAUIGKEIT BEI REFLEXIONSFAKTORMESSUNGEN DURCH RECHNEREINSATZ]
W. Muehlberger *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 53-67 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

Reflection factor measurement at microwave frequencies using long high-precision lines is described. For controlling and evaluation, the aid of a computer is necessary. The design features of the long lines are discussed. The attainable accuracy is shown by measurement results. Hints for further applications, e.g., the measurement of the source matching of a generator, are given.
Author (ESA)

N85-14034# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
REALIZATION OF NOISE POWER IN THE MICROWAVE RANGE BY THERMAL NOISE STANDARDS [REALISIERUNG DER RAUSCHLEISTUNG IM MIKROWELLENGEBIET DURCH THERMISCHE RAUSCHLEISTUNGSNORMALE]
W. Kessel *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 69-81 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

The West German thermal noise standard is described. In the microwave region the realization of the unit watt for noise power is done by thermal noise sources. In order to get a reasonable

high noise power level at the output, the noise generating element has to be driven at high temperatures, which gives rise to special problems. The thermal noise standard for the waveguide system R 100 is taken as an example to show the different influences on the uncertainties in the calibration of other noise sources.
Author (ESA)

N85-14035# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
CALIBRATION OF NOISE POWER TRANSFER STANDARDS, MEASUREMENT UNCERTAINTIES AND LONG TERM STABILITY [KALIBRIERUNG VON RAUSCHLEISTUNGS-TRANSFERNORMALEN, MESSUNSICHERHEITEN UND LANGZEITSTABILITAET]
H. N. Tauscher *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 83-96 In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

Calibration of plasma noise power standards for the transfer of the unit watt for noise power against the primary thermal noise standard and calibration against a plasma source working standard are discussed. In these procedures the noise power intercomparison takes place at quite different power levels. This gives rise to different influences on the uncertainties of the calibration and to special requirements concerning the long time stability of the measuring equipment. Author (ESA)

N85-14036# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
COAXIAL NOISE MEASUREMENT CIRCUITS [KOAXIALE RAUSCHMESSCHALTUNGEN]
D. Janik *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 97-113 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

The problems of building broadband radiometers for the calibration of noise sources with reference to coaxial thermal noise standards in the MHz and lower GHz range are presented. For these frequencies a radiometer with IF attenuation is described and the measuring uncertainties are stated. It is shown that the total uncertainty of this broadband measuring equipment is only slightly larger than the total uncertainty of the narrow band radiometer with RF attenuation for which the smallest uncertainties are reported when waveguide noise sources are calibrated.
Author (ESA)

N85-14037# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
A COMPUTER CONTROLLED MEASURING SYSTEM FOR THE CALIBRATION OF HF COMPONENTS [EIN RECHNERGESTEUERTES MESSSYSTEM ZUR KALIBRIERUNG VON HF-BAUTEILEN]
D. Baehr *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 115-130 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

A system for the calibration of HF components, controlled by a desktop computer is presented. Test results demonstrate how data concerning various parameters of RF components can be obtained and evaluated in the frequency range from 10 MHz to 18 GHz. High frequency power, attenuation, reflection, directivity, and frequency measurements are discussed. Author (ESA)

N85-14038# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
VOLTAGE DEPENDENCE OF THE RELATIVE ac-dc TRANSFER DIFFERENCE FOR HF VOLTAGE-TRANSFER STANDARDS [UEBER DIE SPANNUNGSABHENGIGKEIT DER RELATIVEN WECHSELSPANNUNGS GLEICHSPANNUNGS TRANSFERDIFFERENZ BEI HF-SPANNUNGS-TRANSFERNORMALEN]
D. Janik *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 131-146 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

The voltage dependence of the relative ac-dc difference for thermal converters and resistance mounts was examined. It is shown that the voltage dependence of the ac-dc difference for thermal converters which is not negligible above 30 MHz, can be reduced with special thermocouples. In resistance mounts the change of the input conductance is proportional to the square of the measuring voltage. A procedure to calculate the ac-dc difference variation from the dc conductance change is presented.
Author (ESA)

N85-14039# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
FUNDAMENTALS AND APPLICATIONS OF THE SIX PORT MEASURING TECHNIQUE [GRUNDLAGEN UND ANWENDUNGEN DER SECHSTOR-MESSTECHNIK]
U. Stumper *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 147-180 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

Setup and principle of operation of six port devices are described. Six port devices are alternatives for customary network analyzers using expensive heterodyne systems, especially at very high frequencies. By means of the six port reflectometer the complex reflection coefficient of a two-pole device is determined by observing the output signals of four simple power detectors. All four complex scattering coefficients of a four-pole device can be measured by a setup incorporating two six port reflectometers. Circuits and calibration methods are explained. Author (ESA)

N85-14040# Wandel und Goltermann G.m.b.H. und Cie, Eningen unter Achalm (West Germany).
A GROUP DELAY STANDARD FOR THE MHz FREQUENCY RANGE
E. Weinmann *In* Phys.-Tech. Bunesanstalt Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 181-191 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

An extremely simple group delay standard for the frequency range between 500 kHz and 5.5 MHz and the group delay range between 3 nsec and 2.3 microsec is described. The Nyquist method for the measurement of the group delay is explained. The standard comprises an all-pass filter, which only contains a few passive components. The known specifications of the components provide the effective transfer function, and from the phase curve the variation of group delay with operating frequency is calculated. Therefore, it is possible to trace the measurement of group delay back to the measurement of ohmic resistors, capacities, and frequencies. Author (ESA)

N85-14041# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
CALIBRATING AND MEASURING SYSTEMS FOR ELECTROMAGNETIC FIELDS [KALIBRIEP- UND MESSEINRICHTUNGEN FUER ELEKTROMAGNETISCHE FELDER]
G. Bittner *In its* Special Devel. and Methods in High Frequency Meas. Tech. Dec. 1983 p 193-201 In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

Calibration facilities for electromagnetic measuring equipment are surveyed. These devices measure electric field strength, magnetic field strength, and power flux density in the frequency range between 10 kHz and 2.45 GHz. Author (ESA)

N85-14042# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
TREATMENT AND EXPRESSION OF MEASUREMENT UNCERTAINTIES [ERMITTLUNG UND DARSTELLUNG VON MESSUNSICHERHEITEN]
Friedmund Melchert *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 203-219 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)

Avail: NTIS HC A11/MF A01

A concept for treatment and expression of uncertainties is developed. Statistical and systematic errors are treated the same way, the only difference lies in the lack of information available for the second, being described by an empiric variance. The principle of evaluation of the systematic errors variance is given, as the calculation of the combined total uncertainties. A numerical example is given. Author (ESA)

N85-14043# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).

EVALUATION AND RESULTS OF NATIONAL AND INTERNATIONAL INTERCOMPARISON MEASUREMENTS [UEBER AUSWERTUNG UND ERGEBNISSE NATIONALER UND INTERNATIONALER VERGLEICHSMESSUNGEN]

H. Bayer *In its* Special Develop. and Methods in High Frequency Meas. Tech. Dec. 1983 p 221-243 refs In GERMAN; ENGLISH summary (For primary document see N85-14030 05-33)
Avail: NTIS HC A11/MF A01

The calibration procedure for measuring instruments by tracing them to the national standards is described. This is effected by a calibration chain consisting of a number of calibration offices at different levels within the calibration hierarchy. Unrecognized systematic deviations can be propagated by this method, but national and international intercomparisons are used to discover and eliminate such deviations. Methods for conducting intercomparisons are described and problems of the evaluation are discussed. The high requirements to be met for well-qualified and stable transfer standards are emphasized. On the basis of the results of an international intercomparison of the quantity RF voltage (1 V) at 500 MHz, the evaluation procedure is demonstrated and explained. Author (ESA)

N85-14044# Department of the Air Force, Washington, D.C.

MAGNETOSTATIC WAVE FREQUENCY ANALYZER APPARATUS Patent Application

R. E. Floyd, inventor (to Air Force) Filed 3 Jul. 1984 17 p
(AD-D011249; US-Patent-Appl-SN-627699) Avail: NTIS HC A02/MF A01 CSCL 09/1

A magnetostatic wave frequency analyzer apparatus utilizing forward volume waves is presented. A single input transducer is arranged opposite a plurality of output transducers to receive the opposite a plurality of output transducers to receive the different frequencies of the generated magnetostatic forward volume wave. A geometric ground plane is positioned in the propagation path between the input transducer and the plurality of output transducers to demonstrate the propagation characteristics of magnetostatic forward volume waves (MSFVW) in the 2-6 GHz range. The waves were propagated in two inch diameter YIG La-doped films of varying thickness (20, 30, 40 microns). The waves were launched by the microstrip input transducers on an alumina substrate. Receiver transducers were also on the substrate, but placed approximately one inch way, in a semi-circle with 10 degrees of arc between adjacent transducers. Author (GRA)

N85-14045# Department of the Navy, Washington, D. C.

AN APPARATUS FOR AND A METHOD OF CONTROLLING MULTIPLE TIME-VARYING PROCESSES Patent Application

K. J. Hintz, inventor (to Navy) Filed 3 Jul. 1984 17 p
(AD-D011253; US-Patent-Appl-SN-627707) Avail: NTIS HC A02/MF A01 CSCL 09/3

Document describes an apparatus for and a method of controlling multiple time varying processes by a central control device through a use of an adaptive data acquisition scheme. A state estimator is used to extrapolate the current state of each control process as well as an estimate of the uncertainty of each state estimate. The state whose uncertainty is greatest is selected. The selected process is then measured, estimated, and a control variable calculated. Use of this selection criteria allows a single control device to effectively control more time varying processes then if the controls had been determined by a controller using a fixed sampling rate. Statistics for each process are updated with each measurement in order to compensate for the time/varying nature of the processes. Author (GRA)

N85-14046# Department of the Air Force, Washington, D.C.

HIGH OR LOW-SIDE SOLID STATE RELAY WITH CURRENT LIMITING AND OPERATIONAL TESTING Patent Application

C. R. Dolland, inventor (to Air Force) Filed 11 Jul. 1984 15 p
(AD-D011260; US-Patent-Appl-SN-629862) Avail: NTIS HC A02/MF A01 CSCL 09/5

The switch comprises a circuit from a first output terminal via parallel MOS devices in series with current-sensing resistance to a second output terminal, with alternative high-side and low-side configurations having a load between the second terminal and ground, or the first terminal and the DC supply voltage. An input terminal for a digital control signal is coupled via an input diode and two Schmitt Trigger CMOS inverters to a control lead for the gates of the switch. A current overload or short circuit protection circuit coupled between the current-sensor and the input diode comprises two transistors coupled by a diode. A built-in test circuit for indicating the switch condition (on, off, shorted or open) comprises MOS transistors having their gates connected to voltage dividers at the two output terminals, and their drains connected to discrete indication terminals. Author (GRA)

N85-14047# Department of Energy, Washington, D. C.

PARALLEL FLOW DIFFUSION BATTERY Patent Application

Hsu-Chi Yeh and Yung-Sung Cheng, inventors (to DOE) Filed 1984 15 p
(Contract DE-AC04-76EV-01013)
(DE84-005964; US-Patent-Appl-SN-466922) Avail: NTIS HC A02/MF A01

A parallel flow diffusion battery to determine the mass distribution of an aerosol is described. It has a plurality of diffusion cells mounted in parallel to an aerosol stream in which each diffusion cell includes a stack of mesh wire screens of different density. DOE

N85-14048# Bendix Corp., Kansas City, Mo.

POLYIMIDE-GLASS MULTILAYER PRINTED WIRING BOARDS Final Report

J. W. Lula Jul. 1984 18 p refs
(Contract DE-AC04-76DP-00613)
(DE84-015092; BDX-613-3084) Avail: NTIS HC A02/MF A01

Multilayer printed wiring boards (PWBs) from a polyimide/glass reinforced copper clad laminate and prepreg were manufactured. A lamination cycle and innerlayer copper surface treatment that gave satisfactory delamination resistance at soldering temperatures were developed. When compared to similar epoxy/glass multilayer PWBs, the polyimide PWBs had higher thermal stability, greater resistance to raised lands, fewer plating voids, less outgassing, and adhesion that was equivalent to urethane foam encapsulants. DOE

N85-14049# California Univ., Berkeley. Lawrence Berkeley Lab. Lighting Systems Research Group.

DETERMINING LAMP/BALLAST SYSTEM PERFORMANCE WITH A TEMPERATURE-CONTROLLED INTEGRATING CHAMBER

M. J. Siminovitch, F. M. Rubinstein, and R. R. Verderber Apr. 1984 25 p refs Presented at the Illuminating Engineering Society Ann. Conf., St. Louis, Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-014606; LBL-17285; CONF-840817-1) Avail: NTIS HC A02/MF A01

An experimental integrating chamber for ^{3} measuring the photometric and electrical performance of fluorescent light sources over a wide range of bulb wall temperatures is described. The system was used to measure the relative light output and system efficacy of various solid state ballasted fluorescent lighting systems for minimum bulb wall temperatures between 20(0) and 65(0)C. It is found that when lamp wall temperatures are between 30 and 60(0)C, the relative efficacies of the solid state ballasted systems

are less sensitive to changes in bulb wall temperatures than standard or efficient core coil ballasted systems. DOE

N85-14050# Rensselaer Polytechnic Inst., Troy, N. Y.
THE DETERMINATION OF EDDY CURRENT LOSSES IN ELECTRICAL EQUIPMENT Final Report
S. J. Salon, comp. 1984 522 p refs
(Contract DE-AS05-80CE-76200)
(DE84-016340; DOE/CE-76200/1) Avail: NTIS HC A22/MF A01

The finite element method and boundary integral method for the solution of two dimensional electromagnetic field problems are discussed, and a new technique which combines the two methods, named the finite element boundary integral hybrid method, is introduced. Maxwell's sinusoidally time varying magnetoquasistatic field equations are applied to the single component vector potential formulations of the two dimensional eddy current magnetic field problem. The Galerkin finite element method is applied to the solution of single component magnetic vector potential and electric vector potential boundary value problems. The boundary integral formulation of the single component magnetic vector potential infinite domain problem is presented by developing the boundary integral formulation of Poisson's and Helmholtz's equation for internal regions and Poisson's equation for the external region in terms of an arbitrary scalar potential function. Numerical examples of the technique are presented. The hybrid method is compared with the finite element and boundary integral methods, and the accuracy of the hybrid method is assessed by applying it to a problem with a known closed form solution. DOE

N85-14051# Sandia Labs., Albuquerque, N. Mex.
STANDARD CELL INITIAL PLACEMENT STRATEGY
B. D. Richard Aug. 1984 30 p refs
(Contract DE-AC04-76DP-00789)
(DE84-016921; SAND-83-0704) Avail: NTIS HC A03/MF A01

A standard cell initial placement strategy was developed that incorporates characteristics of both the class of algorithms that is constructive in nature (i.e., bottom-up) and the class that utilizes a top-down partitioning scheme. This approach was pursued recognizing the fact that while both of these types of algorithms exhibit some rather adverse traits both also possess advantageous properties. Specifically, the placement strategy described incorporates both the simplicity of constructive placement methods and the global connectivity information characteristic of placement schemes involving partitioning. The specified algorithm was implemented within the microelectronics computer-aided design facility at Sandia National Laboratories. DOE

N85-14052# Sandia Labs., Albuquerque, N. Mex.
LOW FREQUENCY ELECTRICAL PROPERTIES OF SELECTED DIELECTRICS
D. P. Kelly, J. C. Chato (Illinos Univ., Urbana-Champaign), and J. M. Crowley (Illinois Univ., Urbana-Champaign) 1984 6 p refs Presented at the Wood Energy-Today's Technol. Conf., Raleigh, N.C., 30 Oct. 1984
(Contract DE-AC94-76DP-00789)
(DE84-016220; SAND-84-1676C; CONF-841027-2) Avail: NTIS HC A02/MF A01

The resistivity, permittivity, and dissipation factor of selected dielectric materials were measured with a Harris bridge to find an electrode material in an electrohydrodynamic pump which could produce a 45(0) phase shift. The tested materials were: conductive rubber LM9194-20, conductive rubber LM9194-7, Delrin, polymethyl methacrylate, chlorinate polyvinyl chloride, Drogamid, GE No. 14020 phenolic, duct tape lamination, and polytetrafluorethylene. DOE

N85-14053# California Univ., Berkeley.
DEVELOPMENT OF NOVEL LAMPS FOR STUDY OF ENHANCED PRODUCTION OF RESONANCE BY LOW-DENSITY MERCURY DISCHARGES
Z. X. Wang, D. D. Hollister, and S. M. Berman Jun. 1984 8 p refs Presented at IEEE-IAS Meeting, Chicago, 30 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE84-016889; LBL-17927; CONF-8409108-4) Avail: NTIS HC A02/MF A01

A novel mercury-argon discharge tube is described. The tube incorporates two identical condensation pump cold spots that are employed to determine both the mercury sorption rate and the coefficient of free diffusion for mercury in argon. It is found that equilibration periods for this system depend in part on the temperature difference between the two cold spot surfaces, and on the separation of these surfaces. Sorption of mercury at the discharge tube's surface, and the subsequent cleanup of the mercury charge, are determined by the time rate of change of the equilibration period. Data are incorporated into the design scheme of discharge tubes are incorporated into the design scheme of discharge tubes intended for Zeeman effect and isotope blending studies. DOE

N85-14054# Eagle-Picher Industries, Inc., Joplin, Mo.
RESEARCH, DEVELOPMENT, AND DEMONSTRATION OF NICKEL-IRON BATTERIES FOR ELECTRIC VEHICLE PROPULSION Annual Report, 1983
Aug. 1984 57 p refs
(Contract W-31-109-eng-38)
(DE84-017430; ANL/OEPM-84-3) Avail: NTIS HC A04/MF A01

The significant developments during 1983 indicate the program goals for the nickel-iron battery can be achieved. Plaque development progressed to the point where entirely production feasible nickel sinter is produced in thickness up to 4.0 mm. This plaque is being drawn in one continuous process for slurry application, drying, and sintering. Batteries designed for power capability possess the attributes for ehv applications. Small lightweight designs would provide 100% DOD capacity without sacrifice of cycle life while delivering the power density required for acceleration. The operating temperature range of the nickel iron battery can be extended to the region of -20 and even -30(0)C with the addition of sulfide to the electrolyte. This treatment produces no apparent deleterious effects on normal temperature performance. It appears that the battery can be winterized if and when it is required. The real life cycle capability of the battery is emerging from the life cycle testing. The provisions to avoid the soft-short due to iron sludge in the region of 800 cycles are being shown to be effective. The nickel-iron battery demonstrated itself to be a practical system. DOE

N85-14055# Johnson Controls, Inc., Milwaukee, Wis. Global Battery Div.
RESEARCH, DEVELOPMENT, AND DEMONSTRATION OF LEAD-ACID BATTERIES FOR ELECTRIC VEHICLE PROPULSION Annual Report, 1983
Jun. 1984 115 p refs
(Contract W-31-109-eng-38)
(DE84-017442; ANL/OEPM-84-2) Avail: NTIS HC A06/MF A01

Research on electric motor vehicles is reported in the areas of active material utilization and active material integrity; design and fabrication of components, advanced cells, and modules; cell testing; and battery thermal management and electrolyte circulation subsystems. DOE

N85-14056# Fermi National Accelerator Lab., Batavia, Ill.
MEASUREMENTS OF SATELLITE REFRIGERATION COMPRESSOR POWER CONSUMPTION AND EFFICIENCY
M. Hentges, A. James, T. Peterson, and M. Urso 30 Jul. 1984 10 p refs
(Contract DE-AC02-76CH-03000)
(DE84-016724; FNAL-TM-1276) Avail: NTIS HC A02/MF A01

Thirty compressors installed around the ring and at switchyard are oil injected, two stage, Mycom screw compressor, driven by either a 350 hp or 400 hp motor. The power consumed by these compressors is a major operating expense for the accelerator. The power consumption and efficiency of the compressors was measured. Two compressors are studied, one with a GE 350 hp motor and one a new GE 400 hp high efficiency motor. Data is

taken for each compressor with the high stage fully loaded. These calculated data and values are presented. DOE

N85-14057# Battelle Inst., Frankfurt am Main (West Germany).
PRELIMINARY STUDY FOR AN IR-VIDICON FOR THE 8 TO 14 MICRON RANGE, PHASE 1 Final Report, Nov. 1978
Friedrich Dolezalek Bonn Bundesministerium fuer Forschung und Technologie Jun. 1984 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-025; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,50

Polyvinylidene fluoride was examined as infrared vidicon target material. Laboratory methods that render commercially-available 7 to 50 micron thick polyvinylidene fluoride films strongly pyroelectric were developed. The feasibility of using such films as infrared vidicon targets is demonstrated with a demountable vidicon and a moving infrared scene. The minimum temperature difference which can be detected is 0.7 K for 5 line pairs per millimeter. The uncomplicated handling of polyvinylidene fluoride films recommends them for a pyroelectric imaging tube with a large target.
Author (ESA)

N85-14058# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abteilung Akustik.
DETERMINATION OF THE PRESSURE SENSITIVITY OF 1 INCH CONDENSER MICROPHONES [DIE BESTIMMUNG DES DRUCK-LEERLAUF-UEBERTRAGUNGSMASSES VON 1-ZOLL-KONDENSATORMIK-ROFONEN]
Klaus Brinkmann, Knut Obermayr, and Guenter Lager Mar. 1984 84 p refs In GERMAN
(PTB-Ak-26; ISSN-0340-8639) Avail: NTIS HC A05/MF A01

A procedure for the determination of the pressure sensitivity of 1 inch condenser microphones was developed. As factors which influence operating of microphones polarization, voltage, transmission voltage, air pressure, temperature and humidity are considered, a method for measurement of the electrical transfer impedance is given. The acoustic transfer impedance of the coupler system is calculated and presented as a function of frequency. An example of the calculation of the pressure sensitivity from the acoustic impedance of a microphone is given. Author (ESA)

N85-14059# Prema G.m.b.H., Mainz (West Germany).
USER-ORIENTED DEVELOPMENT AND PRODUCTION OF INTEGRATED CIRCUITS IN SMALL AND MEDIUM QUANTITIES Final Report, Sep. 1983
Heiner Flocke, Karl-Erich Schneidewind, and Gerhard Beck Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 75 p ref In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-171; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

User-orientated integrated circuit (IC) computer assisted design systems, standard cells, and high resolution analog to digital converters were developed. Interfaces for development and layout of custom IC by the user were verified. Linearity tests show a variance of 3 digits for a resolution of 2,000,000 digits. The unit replaces a full component plate of 6 by 10 cm. Author (ESA)

N85-14060# Starck (Hermann C.) Berlin, Baden (West Germany).
DEVELOPMENT AND TESTING OF TIB2, USED AS CATHODE MATERIAL IN AI-ELECTROLYSIS CELLS Final Report, Jun. 1983
Dietmar Fister, Wolfgang Kiliani, and Guenter Wagner Bonn Bundesministerium fuer Forschung und Technology Aug. 1984 60 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-176; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,50

For the production of sintered tiles, TiB2-powders qualified as inserts in Al-electrolysis cells were developed. Carbothermic reactions were used to obtain the TiB2-Powders. Good sinterable powder qualities were produced and sintered parts were made from them by vacuum-sintering. The sintered parts were tested in laboratory electrolysis. Furnace designs which allow the production of large amounts of powders were developed. Author (ESA)

N85-14061# Duisburg Univ. (West Germany). Fachgebiet Werkstoffe der Electrotechnik.
PRACTICAL APPLICATION OF ELECTRON BEAM TESTING IN LSI AND VLSI CIRCUITS Final Report, Feb. 1983
Siegfried Goerlich and Erich Kubalek Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 195 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-185; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

The electron beam testing of integrated circuits was studied. Parameters were evaluated for the electron beam acting in a passive way as a nonloading and nondestructive microprobe (voltage measuring method) and in an active way as a micron scaled current source (current impressing mode). The necessary conditions for an absolute determination of integrated circuit internal signals were determined and the required instrumental modifications were realized in the VLSI test system. The testing technique can be extended to passivated devices. Testing via the conductive channel that shorts insulating layers is suited for bipolar and metal oxide semiconductor devices, if radiation damage is excluded by switching off the scanned electron beam at gate oxides. Investigations show that the capacitive coupling voltage contrast may offer an easier alternative. Author (ESA)

N85-14062# Stuttgart Univ. (West Germany). Inst. fuer Netzwerk- und Systemtheorie.
SWITCHED CAPACITOR (SC) FILTER AND DESIGN CENTERING OF INTEGRATED CIRCUITS, PART 1 Final Report, Feb. 1983
Ernst Lueder, Michael Opelt, and Elisabeth Weng Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 65 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-190-Pt-1; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,50

Design principles of switched capacitor filters are outlined. Fabrication yield of 4 groups were compared using a telephone pulse code modulation lowpass filter with 50 Hz suppression. Optimized dynamic range and minimized sensitivity are achieved by design centering. Author (ESA)

N85-14063# Dortmund Univ. (West Germany). Lehrstuhl fuer Physikalische Chemie 1.
PHYSICO-CHEMICAL INVESTIGATIONS ON THE ELECTRONIC PARTIAL CONDUCTIVITY OF MOLTEN ELECTROLYTES, ESPECIALLY OF THE EUTECTIC MIXTURE LICI-KCI Final Report, Sep. 1983
Hans Rickert and Meinhard Meyer Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 0099 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-205; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

The self-discharge of lithium-sulfur batteries caused by the electronic partial conductivity of the electrolyte was estimated. Stationary polarization measurements were used to determine the electronic conductivity in the eutectic melt LiCl-KCl at temperatures from 400 to 500 C. From investigations on the solubility of lithium in the melt, the diffusion coefficient of the conducting particles was obtained using a coulometric titration method. Author (ESA)

N85-14064# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
DESIGN AND CONSTRUCTION OF A MODE CONVERTER FROM RECTANGULAR TE 10 TO CIRCULAR TE 11
B. J. D. Tubbing Aug. 1984 21 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-84-158) Avail: NTIS HC A02/MF A01

The design and manufacturing of a waveguide mode converter from the TE10 mode in oversized rectangular to the TE11 mode in oversized circular waveguide is described. A differential equation for the cross sectional shape of the converter was solved numerically. A stainless steel mandrel was produced on a numerically controlled milling machine. Sixteen converters were produced by electroforming on one mandrel. Author (ESA)

N85-13878*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MOTOR/GENERATOR AND ELECTRONIC CONTROL CONSIDERATIONS FOR ENERGY STORAGE FLYWHEELS
Frank Nola *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 389-406 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 09C

N85-13986*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUPERCONDUCTING NbTi AND Pb(Cu) BANDPASS FILTERS
J. J. Bautista and S. M. Petty *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 62-68 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

N85-13987*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AVALANCHE PHOTODIODE STATISTICS IN TRIGGERED-AVALANCHE DETECTION MODE
H. H. Tan *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 69-80 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

N85-13989*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVED CARRIER TRACKING BY SMOOTHING ESTIMATORS
C. A. Pomalaza Raez and W. J. Hurd *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 96-106 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-14065 British Library Lending Div., Boston Spa (England).
THE PERFECTING OF THE METHOD OF EXPERIMENTAL-ANALYTIC SOLUTION OF THE PROBLEM OF STATIONARY PLASTIC FLOW
V. K. Vorontsov, V. V. Brinza, and V. Yu. Lapiner 7 Nov. 1984 4 p refs Transl. into ENGLISH from Iz. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1984 p 138
(BLL-M-35938-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

Further refinements were to the Euler-Lagrange model for stationary plastic flow and the resulting model incorporated into a FORTRAN program and used experimentally with satisfactory results. Author

N85-14066 British Library Lending Div., Boston Spa (England).
CERTAIN OPTIMAL PARAMETERS OF HIGH-VELOCITY VENTURI EJECTION TUBES
S. B. Stark, I. G. Reznichenko, and Yu. P. Pavlenko 7 Nov. 1984 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1984 p 101-103
(BLL-M-35924-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, England

The influence of the geometrical characteristics of centrifugal nozzles in high velocity Venturi ejection tubes for atomizing liquid in gas cleaning plant is analyzed. An optimal value of the nozzle geometrical characteristic, which is a function of the degree of filling of the nozzle outlet opening by the liquid, is given, at which the throat length is independent of water pressure before the nozzle. Author

N85-14067 British Library Lending Div., Boston Spa (England).
MODELLING THE AERODYNAMICS IN A SYSTEM OF CONTINUOUS CHANNELS AND EXPERIMENTATION PROCEDURE
S. L. Solomentsev, F. R. Shklyar, and V. D. Korishkov 7 Nov. 1984 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 3, 1984 p 98-101
(BLL-M-35923-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Procedures were developed for making aerodynamic models of parallel continuous channels, an arrangement often involved in metallurgy and power engineering, together with experimentation procedures for the models obtained. The procedures enable fabrication of models to be simplified and experimentation under laboratory conditions made easier. Author

N85-14068 Delaware Univ., Newark.
NAVIER-STOKES COMPUTATIONAL STUDY OF AXISYMMETRIC TRANSONIC TURBULENT FLOWS WITH A TWO-EQUATION MODEL OF TURBULENCE Ph.D. Thesis
Jubaraj Sahu 1984 130 p
Avail: Univ. Microfilms Order No. DA8420945

A thin layer Navier-Stokes code has been used to compute the turbulent flow over two axisymmetric bodies at transonic speeds and the results are compared to experiment. A critical element of calculating such flows is the turbulence model. Numerical computations have been made with an algebraic eddy viscosity model and the kappa-epsilon two equation model. The kappa-epsilon equations are developed in the general spatial coordinates and incorporated into the thin layer, compressible, time dependent Navier-Stokes code. The same implicit algorithm that simultaneously solves the mean flow equations is extended to solve the turbulence field equations using block tridiagonal matrix inversions. Calculations with the kappa-epsilon model are extended up to the wall and exact values of kappa and epsilon at the wall are used as boundary conditions. The thin layer form of the compressible Navier-Stokes equations is solved using a time dependent, implicit, finite difference scheme. An approximate factorization scheme is used to reduce the problem. Dissert. Abstr.

N85-14069 Polytechnic Inst. of New York, Brooklyn.
A SIMILARITY ANALYSIS OF PHASE CHANGE HEAT CONDUCTION IN CORNERS Ph.D. Thesis
Wanlie Zheng 1984 127 p
Avail: Univ. Microfilms Order No. DA8420476

A similarity analysis of heat conduction in a wedge with or without phase change is presented. Similarity in the temperature profile for heat conduction with constant boundary temperature does not result in similarity of heat flow rate at the wedge surface. However, integrating the heat flow rate across the surface recovers this similarity. Geometric factors are introduced to facilitate the calculation of the integrated heat flow rate for two-dimensional heat conduction with or without phase change. Similarity of the integrated heat flow rate is then extended to two-dimensional solidification system consisting of a solidifying liquid in constant

with a heat-absorbing solid, where the interface temperature between the solidified liquid and the heat-absorbing solid is no longer a constant value. For three-dimensional heat conduction, the integrated edge function, defined as the ratio of the surface-integrated heat flow rate for three-dimensional heat conduction system to that for a reference one-dimensional system, is established as a useful similarity parameter. Dissert. Abstr.

N85-14070 California Inst. of Tech., Pasadena.
MASS AND MOMENTUM TRANSPORT IN A TURBULENT BUOYANT VERTICAL AXISYMMETRIC JET Ph.D. Thesis
Panayiotis Nikolas Papanicolaou 1984 307 p
Avail: Univ. Microfilms Order No. DA8420824

Turbulent buoyant jet behavior was examined over a wide range of initial jet Richardson numbers. Information was obtained concerning the mean values, turbulent fluctuations and correlations between w, u and c, up to 100 jet and 80 plume diameters downstream of the jet exit. The results from dimensional analysis were verified experimentally. It was determined that the turbulent flux of a tracer (or buoyancy) varied from 6% to 10% for jets and was 15% to 20% of the total for plumes. The turbulent momentum flux was found to be 15% of the local momentum flux transported by the mean flow. While the profiles of w and c and the turbulent velocity profiles are found to be much the same for both jets and plumes, the turbulence intensity profiles of the concentration take higher values in plumes than in jets. More rapid dilutions were obtained in buoyancy driven plumes than in momentum driven jets. Dissert. Abstr.

N85-14071 Massachusetts Univ., Boston.
A FINITE ELEMENT METHOD FOR THREE DIMENSIONAL CAVITY CIRCULATION Ph.D. Thesis
Yuan Cheng 1984 229 p
Avail: Univ. Microfilms Order No. DA8418878

A three dimensional finite element model was developed. It successfully predicts the velocity distribution in a rectangular cavity. The model is basically set up by the Galerkin, weighted residual method with the discretization of twenty-node elements in brick shape. Two approaches were studied. One is the penalty function method which also incorporated the continuation method when the nonlinear convective term is considered. Another approach is called the mixed interpolation method. The penalty function method was shown to be the better of the two. The resulting flow velocity compares favorable with existing numerical models. One main contribution is that flexible parameters including the artificial viscosity, element size and velocity gradient on the free surface were all included in the model as nondimensional functions. Also the effect of grid refinement was shown. The second principal contribution is that the approximate numerical integration for the pressure term is two orders lower than the exact integration, instead of the usual one order lower procedure. Dissert. Abstr.

N85-14072 Stanford Univ., Calif.
DIRECT NUMERICAL SIMULATION OF CURVED TURBULENT CHANNEL FLOW Ph.D. Thesis
Robert DeLancey Moser, Jr. 1984 172 p
Avail: Univ. Microfilms Order No. DA8420595

Low Reynolds number mildly curved turbulent channel flow has been simulated numerically without subgrid scale models. A new spectral numerical method developed for this problem was used. The computations were performed with two million degrees of freedom. A variety of statistical and structural information has been extracted from the computed flow fields. These include mean velocity turbulence stresses, velocity skewness and flatness factors, space time correlations and spectra, all the terms in the Reynolds stress balance equations, and contour and vector plots of instantaneous velocity fields. The effects of curvature on this flow were determined by comparing the concave and convex sides of the channel. The observed effects are consistent with experimental observations for mild curvature. The most significant difference in the turbulence statistics between the concave and convex sides was in the Reynolds shear stress. This was accompanied by significant differences in the terms of the Reynolds shear stress balance equations. Dissert. Abstr.

N85-14073 Minnesota Univ., Minneapolis.
BICOMPONENT FLOW PROBLEMS IN RHEOLOGICAL FLUID MECHANICS Ph.D. Thesis
Ky Thanh Nguyen 28 Dec. 1984 204 p
Avail: Univ. Microfilms Order No. DA8418522

The arrangement of components in steady flow of immiscible liquids is typically non-unique. The problem of selection of arrangements is defined and is studied by variational methods under the hypothesis that the realized arrangements are the ones that maximize the speed on exterior boundaries for prescribed boundary tractions, or the ones that minimize the tractions for prescribed speeds. The arrangements which minimize tractions also minimize the dissipation by putting the low-viscosity liquid in regions of high shear. In fact some kind of shielding of high-viscosity liquids is always observed. Another problem involving flow of immiscible liquids is jets of the liquid into another. If the change in the momentum of the entrained lighter liquid is neglected the jet will ultimately reach a modified Torricelli limit. An extended unsteady problem including effects of intrainment is formulated in terms of nonlinear ordinary differential equations which also account for weak radial variations of the velocity across the cross-section of the jet. Dissert. Abstr.

N85-14074 Stanford Univ., Calif.
EXPERIMENTS ON THE STRUCTURE OF TURBULENT RE-ATTACHING FLOW Ph.D. Thesis
Eric William Adams 1984 434 p
Avail: Univ. Microfilms Order No. DA8420479

Two experiments were performed, aimed at improving the understanding of the flow structure and scaling of separated flows. The backward facing step geometry was chosen as a representative separated flow. Dimensional analysis of the backward facing step suggests that any flow variable of interest, for example the reattachment length, is a function of several nondimensional parameters, most importantly, the expansion ratio, the step height Reynolds number, and the nondimensional upstream boundary layer thickness and state. The role of these parameters was investigated in detail using measured pressure distributions, reattachment lengths, and recovery region velocity profiles. Specifically, as the upstream boundary layer undergoes transition from laminar to turbulent flow, a 30% increase in the reattachment length and a 50% decrease in the wall skin friction in the recirculation zone were noted. The structure and state of the near wall region beneath the separation bubble were studied using detailed laser Doppler anemometry profiles. Dissert. Abstr.

N85-14075 Stanford Univ., Calif.
NUMERICAL INVESTIGATIONS INTO THE PARABOLIZED NAVIER-STOKES EQUATIONS Ph.D. Thesis
Daniel Wayne Barnette 1984 177 p
Avail: Univ. Microfilms Order No. DA8420487

Several finite differences schemes for the parabolized Navier-Stokes (PNS) equations are introduced. These schemes are investigated for accuracy and robustness by solving the PNS equations over a 10% thick parabolic arc airfoil in a Mach 2 flowfield. Each scheme varies in the manner in which the finite difference equations are modeled in the subsonic sublayer region. Departure solutions associated with grid refinement are discussed and investigated using an innovative numerical eigenvalue technique for single sweep schemes. Eigenvalue/vector histories of departure solutions are presented to verify the technique. A global iteration scheme is given that requires no more than one to two iterations for convergence for the airfoil flowfield and can be used to overcome the problems associated with departure solutions. Dissert. Abstr.

N85-14076 California Univ., Los Angeles.
THE EFFECT OF GRAZING FLOW ON THE IMPEDANCE OF THE HELMHOLTZ RESONATOR Ph.D. Thesis
Nghiem-Minh Nguyen-Vo 1984 124 p

Avail: Univ. Microfilms Order No. DA8420221

A theoretical model for an acoustically excited Helmholtz resonato . in a steady grazing flow is presented for the case of low excitation frequency and amplitude, and moderate grazing flow Mach number. The analysis is based on he two-dimensional linearized inviscid equation of motion. The case with razing flow was solved using the Green's function technique. The Kutta condition at the upstream edge of the slit and a displacement thickness wave on the downstream wall was introduced to mathematically model the effect of vortex shedding at the sharp edges of the slit. This vortex shedding provides the mechanism by which acoustic energy is converted to vortical energy which is carried away by the grazing flow. The result of the limiting case of vanishingly small grazing velocity also agrees with the result of the case without grazing flow. Dissert. Abstr.

N85-14077# European Space Agency, Paris (France).

OSCILLATORY CONVECTION

Roland Kessler Oct. 1984 99 p refs Transl. into ENGLISH from "Oszillatorische Konvektion" Rept. DFVLR-FB-84-14 Inst. for Theoretical Fluid Mech., Geottingen (West Germany) Previously announced as N84-33756

(ESA-TT-890; DFVLR-FB-84-14) Avail: NTIS HC A05/MF A01

The steady and oscillatory convection in a rectangular box heated from below and cooled from above was studied theoretically. The spatial structure of the three-dimensional flow, caused by the vertical boundaries of the box, is influenced by the Prandtl number and thermal boundry conditions of the side walls. These three-dimensional effects of the convection flow are discussed with reference to the theoretical steady flow. The onset and the frequency of the oscillatory instability are determind by solving the nonlinear, time-dependent equations. The numerical solutions show that the cause of this stability depends very heavily on the Prandtl number. The physics of the theoretical oscillatory flow is discussed and compared with experimental results. A Galerkin method for solving the three-dimensional, time-dependent Navier-Stokes equations is presented. Author

N85-14078*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOW RATES AND PRESSURE PROFILES FOR ONE TO FOUR AXIALLY ALINED BORDA INLETS

Robert C. Hendricks and T. Trent Stetz Dec. 1984 32 p refs (NASA-TP-2390; E-1979; NAS 1.60:2390) Avail:. NTIS HC A03/MF A01 :b CSCL 20A

Choked flow rate and pressure profile data were taken on sequential, axially alined inlets of the Borda type. The configurations consisted of two to four inlets spaced 0.8 and 30 diameters apart. At a spacing of 30 diameters the reduced flow rate appeared to follow the simple empirical relation G sub r/G sub r,1 = N(-b), where G sub r,1 is the reduced flow rate for a single inlet; N is the number of inlets; and b, which is weakly temperature dependent, is approximately 0.4. The relation is in reasonable agreement with an analysis of the N-inlet configuration. At a spacing of 30 diameters the pressure profiles dropped sharply at the entrance and partially recovered within each inlet somewhat independently of N. Jetting through the last Borda was common at low temperatures. At a spacing of 0.8 diameter fluid jetting was prevalent at low temperatures for each configuration studied and flow rates were the same as that for a single inlet. M.G.

N85-14079# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

FLOW IN CENTRIFUGAL COMPRESSORS

1984 394 p refs Lecture Series held at Rhode-Saint-Genese, Belgium, 28-30 May 1984

(VKI-LS-1984-07) Avail: NTIS HC A17/MF A01

Experimental observation of flow in impellers and diffusers; analyzing thermodynamic problems with three dimensional viscous flow calculations; design and off-design performance prediction of high pressure ratio centrifugal compressors; pressure loss due to the tip clearance of impeller blades in centrifugal and axial blowers; vaneless diffusers; vaned diffusers; low solidity cascade diffusers for wide flow range centrifugal blowers; and surge and stall in centrifugal compressors were discussed. For individual titles, see N85-14080 through N85-14087.

N85-14080# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

EXPERIMENTAL OBSERVATION OF THE FLOW IN IMPELLERS AND DIFFUSERS

H. Krain *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 70 p refs (For primary document see N85-14079 05-34)

Avail: NTIS HC A17/MF A01

Conventional and optical measurements were carried out within centrifugal compressor impellers and diffusers. A highly distorted impeller discharge flow, pointing to a mass flow concentration in the hub area and a wake flow close to the shroud, is indicated by the conventional measurements. This flow character causes a highly nonuniform flow incidence angle distribution at the diffuser vane leading edge resulting in a strong impeller/diffuser interaction. These results are confirmed by laser measurements, which also reveal the fully three-dimensional flow character within the impeller and diffuser. The unsteady flow behavior within the diffuser inlet area was studied. Due to the distorted impeller discharge flow, fluctuations of the absolute flow angle up to 17 deg occur in the vaned diffuser inlet area. An incidence angle difference between hub and shroud of 27 deg is present at the diffuser vane leading edge. Author (ESA)

N85-14081# Virginia Polytechnic Inst. and State Univ., Blacksburg.

ANSWERING THERMODYNAMIC QUESTIONS WITH THREE-DIMENSIONAL VISCOUS FLOW CALCULATIONS

John Moore *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 101 p refs (For primary document see N85-14079 05-34)

Avail: NTIS HC A17/MF A01

The use of three dimensional viscous flow calculations to understand losses and irreversibility in turbomachinery flows, and to show where inefficiency arises is discussed. An IBM 3032 computer and a Prandtl mixing length turbulence model were used to study centrifugal compressor impellers operating with steady, subsonic flow near their design point. For this class of flow, three dimensional viscous flow calculations can show boundary layer growth and accumulation in wake flow; tip leakage flow and mixing; work and loss distributions; and sources of loss production. Author (ESA)

N85-14082# Napier Turbochargers Ltd., Lincoln (England).

DESIGN AND OFF-DESIGN PERFORMANCE PREDICTION OF HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSORS

W. A. Connor *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 73 p refs (For primary document see N85-14079 05-34)

Avail: NTIS HC A17/MF A01

Centrifugal compressor performance prediction methods are described. Overall compressor performance prediction from a data base of experimental performance characteristics; overall performance prediction using impeller and diffuser pressure rise; component and overall performance prediction using throat blockage and static pressure recovery concepts; and performance prediction methods based upon detailed component performance modeling are outlined. Author (ESA)

N85-14083# Kyushu Inst. of Tech., Kitakyushu (Japan).

PRESSURE LOSS DUE TO THE TIP CLEARANCE OF IMPELLAR BLADES IN CENTRIFUGAL AND AXIAL BLOWERS

Y. Senoo *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 51 p refs (For primary document see N85-14079 05-34)

Avail: NTIS HC A17/MF A01

Equations to evaluate pressure loss based on the tip clearance of impeller blades (pressure loss induced by the leakage flow through the clearance, and pressure loss for supporting fluid against the pressure gradient in the thin annular clearance space

between the shroud and the impeller) are derived. The predicted pressure losses are compared with experimental data for two types of centrifugal impellers. The equations are simplified for axial impellers as a special case, and the predicted efficiency-drop is compared with the experimental data for seven cases. Good agreement is demonstrated. Author (ESA)

N85-14084# Kyushu Inst. of Tech., Kitakyushu (Japan).
VANELESS DIFFUSERS
Y. Senoo *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 40 p refs (For primary document see N85-14079 05-34)
Avail: NTIS HC A17/MF A01

The influence of vaneless diffusers on flow in centrifugal compressors, particularly on surge, is discussed. A vaneless diffuser can demonstrate stable operation in a wide flow range only if it is installed with a backward leaning blade impeller. The circumferential distortion of flow in the impeller disappears quickly in the vaneless diffuser. The axial distortion of flow at the diffuser inlet does not decay easily. In large specific speed compressors, flow out of the impeller is distorted axially. Pressure recovery of diffusers at distorted inlet flow is considerably improved by half guide vanes. The best height of the vanes is a little $< 1/2$ diffuser width. In small specific speed compressors, flow out of the impeller is not much distorted and pressure recovery can be predicted with one-dimensional flow analysis. Wall friction loss is significant in narrow diffusers. The large pressure drop at a small flow rate can cause the positive gradient of the pressure-flow rate characteristic curve, which may cause surging. Author (ESA)

N85-14085# Kyushu Inst. of Tech., Kitakyushu (Japan).
VANED DIFFUSERS
Y. Senoo *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 28 p refs (For primary document see N85-14079 05-34)
Avail: NTIS HC A17/MF A01

Interaction between impeller and vaned diffusers; flow nozzle tests of vaned diffusers; and throat blockage and flow range of vaned diffusers are discussed. Vaned diffusers are very difficult to analyze because of the complicated inlet condition of flow and the three dimensional nature of the wall boundary layer in the semivaneless space which influences the throat blockage. Variety of diffuser geometry makes the problem even more complicated. In order to correlate many experimental data, the inlet stagnation pressure must be consistent, but sometimes it is the value at the middle of the diffuser depth, sometimes it is the mean value, and sometimes it is estimated from the input power and the flow rate. Author (ESA)

N85-14086# Kyushu Inst. of Tech., Kitakyushu (Japan).
LOW SOLIDITY CASCADE DIFFUSERS FOR WIDE FLOW RANGE CENTRIFUGAL BLOWERS
Y. Senoo *In* Von Karman Inst. for Fluid Dyn. Flow in Centrifugal Compressors 1984 32 p refs (For primary document see N85-14079 05-34)
Avail: NTIS HC A17/MF A01

Low solidity circular cascades were used as a part of diffusers of centrifugal blowers. They demonstrate good pressure recovery and a wide flow range, comparable to vaneless diffusers. In spite of the extremely low aspect ratio the performance of the cascade is predicted well by one-dimensional single airfoil theory with cascade correction. The maximum lift coefficient is 1.6. Oil traces along the side walls demonstrate that such a high lift coefficient is possible only when the boundary layer on the blade suction surface is removed by the secondary flow along the side walls. Number of blades, solidity and stagger angle are important in controlling secondary flow along the side wall. Author (ESA)

N85-14087# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
SURGE AND STALL IN CENTRIFUGAL COMPRESSORS
R. VandenBraembussche *In its* Flow in Centrifugal Compressors 1984 89 p refs (For primary document see N85-14079 05-34)
Avail: NTIS HC A17/MF A01

Surge and stall are defined, and experimental and theoretical investigations of surge in compressors, stall in vaned flow passages, and stall in vaneless flow passages are reviewed. Ways to delay surge and stall are outlined. Actions to influence the surge limit during design or to correct for an eventual misprediction often decrease efficiency when the range has to be increased. The main action to avoid surge and stall is a safe design of impeller and diffuser and a correct matching of both components. Author (ESA)

N85-14088# Brookhaven National Lab., Upton, N. Y.
A REFINED COMPUTER PROGRAM FOR THE TRANSIENT SIMULATION OF GROUND COUPLED HEAT PUMP SYSTEMS
J. W. Andrews, P. D. Metz, and J. H. Saunders Apr. 1983 8 p refs Presented at the 6th Ann. ASME Solar Energy Div. Tech. Conf., Las Vegas, Nev., 10 Apr. 1984
(Contract DE-AC02-76CH-00016)
(DE84-014098; BNL-34818; CONF-840402-7) Avail: NTIS HC A02/MF A01

The use of the earth as a heat source/sink or storage medium for various heat pump based space conditioning systems were investigated. A computer program ground coupled system (GROCS) was developed to model the behavior of ground coupling devices. The GROCS was integrated with TRNSYS, the solar system simulation program, to permit the simulation of complete ground coupled heat pump systems. Experimental results were compared to GROCS simulation results for model validation. It is found that the model has considerable validity. A refined version of the GROCS-TRNSYS program developed to model vertical or horizontal earth coil systems, which considers system cycling is described. The design of the program and its interaction with TRNSYS are discussed. DOE

N85-14089# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
INFLUENCE OF PRANDTL NUMBER ON NATURAL CONVECTION HEAT TRANSFER CORRELATIONS
Mark S. Bohn and Ren Anderson Jul. 1984 25 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013006; SERI/TR-252-2067) Avail: NTIS HC A02/MF A01

The influence of fluid properties, specifically the Prandtl number, on previously developed heat transfer measurements in water-filled enclosures is examined. According to the available literature, changing the Prandtl number from 0.7 (air) to 5 (water) increases the heat transfer by roughly 15% for various geometries. This effect was tested and confirmed in a cubical test cell by replacing the water in the test cell with air and repeating a series of experiments. The results were then compared with previously developed heat transfer correlations in water. DOE

N85-14090# Los Alamos Scientific Lab., N. Mex.
TITANIUM-POTASSIUM HEAT PIPE CORROSION STUDIES
Lynn B. Lundberg Jul. 1984 13 p refs Presented at the Intern. Symp. on High Temp. Corrosion in Energy Systems, Detroit, 17 Sep. 1984
(Contract W-7405-eng-36)
(DE84-015526; LA-UR-84-2375; CONF-840978-1) Avail: NTIS HC A02/MF A01

The susceptibility of wickless titanium/potassium heat pipes to corrosive attack was studied in vacuo at 800(0)K for 6511h and at 900(0)K for 4797h without failure or degradation. Some movement of carbon, nitrogen and oxygen in the titanium container tube was observed, but no evidence of attack was detected in metallographic cross sections of samples taken along the length of the heat pipes. The lack of observable attack of titanium by potassium under these conditions refutes previous reports of Ti-K incompatibility. DOE

N85-14091# Technische Univ., Berlin (West Germany). Inst. fuer Chemieingenieurtechnik.
DEVELOPMENT OF A MASS TRANSFER MACHINE FOR GAS/

LIQUID OPERATIONS IN THE ABSENCE OF GRAVITY Final Report, May 1983
Heinz Brauer and Wilhelm Gaebelein Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 181 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-027; ISSN-0170-1339) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM34,50

A mass transfer machine for gas/liquid operations under low gravity was developed. It consists of two flat rotors, the inner surfaces being ribbed in radial direction. Due to the rotation of the machine, the liquid introduced in the center, is repeatedly dispersed on the edges of the ribs, which are arranged in series. Transport, dispersion and separation of liquid and gas are effected by centrifugal forces. The fluid dynamics were investigated for countercurrent, transition and cocurrent flow. The mass transfer investigations were carried out by desorption of CO2 from water into air. The machine is well suited for air cleaning in spacecraft or submarine labs. Author (ESA)

N85-14092# Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik und Energiesysteme.
THEORETICAL DESCRIPTION OF FILM BOILING IN A TWO PHASE FLOW CALCULATION [THEORETISCHE BESCHREIBUNG DES DAMPFFILMSIEDENS IN EINER ZWEIPHASIGEN BEHANDLUNG]
Manfred Buerger and Erwin Kammerer Dec. 1983 75 p refs In GERMAN; ENGLISH summary
(IKE-2-66) Avail: NTIS HC A04/MF A01

For the description of free convection film boiling on vertical plates, horizontal cylinders, and spheres, a two phase model was used. The boundary layer equations were reduced to systems of ordinary differential equations using a combination of similarity transformations and series expansions. The resulting differential equations were integrated numerically. The case of laminar free convection was studied. The results of the calculations performed for a water system are discussed. Comparison with the single phase model was made. The boundary layer thickness and the influence of the convective and mass transport term of the Navier-Stokes equations are studied up to a wall temperature of 1573K. Author (ESA)

N85-14093# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Reaktorsicherheit.
INVESTIGATION OF PHASE SEPARATION MODELS IN RELAP 4/MOD 6
Hans Pfau, Ivan Toth (Central Research Institute for Physics, Budapest), and Gerald Sonneck Aug. 1984 34 p refs Presented at Intern. Atomic Energy Agency Workshop on the IAEA Program in Uses of Computer Codes for Safety Anal., Drushba, Bulgaria, 28 May-1 Jun. 1984 Sponsored by Austrian Academy of Sciences and Hungarian Academy of Sciences
(OEFZS-4286; RS-241/84) Copyright. Avail: NTIS HC A03/MF A01

Calculation of blowdown processes with the RELAP 4/MOD 6 code and various phase separation models was investigated using Dementev's blowdown experiment and different bubble rise velocities (VBUBs) and bubble density gradients (ALPHAs). Results of the parametric study show that the cases with a relatively low bubble rise velocity (VBUB = 0.5 and 1.0 ft/sec) and ALPHA = 1.0 give the closest agreement with the test for pressure, total mass, early void fraction and mixture level evolution. The results with the Wilson bubble rise model are not satisfactory because the Wilson model used VBUBs which were too high for the Dementev experiment. Author (ESA)

N85-14094# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.
WAVE PROPAGATION IN COMPLIANT TUBES CONTAINING A HEAT-CONDUCTING VISCOUS FLUID
G. D. C. Kuiken Mar. 1984 43 p refs
(WTHD-163) Avail: NTIS HC A03/MF A01

Wave propagation in an initially stressed, viscoelastic circular cylindrical orthotropic tube, surrounded by external materials and filled with a linear elastic heat conducting fluid is studied. General thermoacoustic boundary conditions are considered. The theorem of splitting is generalized showing that an infinitesimal disturbance field can always be split into three modes which interact with each other only through the boundary conditions. The consequences of the Newtonian constitution and the continuum theory are demonstrated. A fundamental error is noted in the Kirchhoff (1868) theory. Approximations of the dispersion equation are discussed and generalizations of the low-frequency expansion solution are given. The transfer matrix and the impedances of a fluid line are shown. Author (ESA)

N85-13786# Leicester Univ. (England).
ACCELERATION OF BLUFF BODIES THROUGH FLUIDS
D. J. Cockrell *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 22 p (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

N85-13895*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THERMAL MANAGEMENT TECHNOLOGY STATUS
Richard C. Parish *In* NASA. Lewis Research Center Space Power Apr. 1984 p 189-203 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 20D

N85-14657# Joint Publications Research Service, Arlington, Va.
DESIGN OF SWIRLED AXISYMMETRIC TURBULENT JETS Abstract Only
Z. Sh. Zhumayev, A. A. Abramov, and R. A. Fayziyev *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 20 Transl. into ENGLISH from Izv. Akad. Nauk Uzb. SSR, Ser. Tekh. (Tashkent, USSR), no. 2, Mar. - Apr. 1984 p 51-54 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

N85-14658# Joint Publications Research Service, Arlington, Va.
PROCEDURAL ASPECTS OF TESTING AERODYNAMIC MODELS WITH COMBUSTION IN HIGH-ENTHALPY TRANSIENT-MODE INSTALLATIONS Abstract Only
V. K. Bayev, V. V. Shumskiy, and M. I. Yaroslavtsev *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 20 Transl. into ENGLISH from Izv. Sib. Otd. Akad. Nauk SSSR, Ser. Tekh. Nauk, no. 4, issue 1, Mar. 1984 p 68-77 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-14095 Stanford Univ., Calif.
CONTRIBUTIONS TO THE ERROR ANALYSIS IN THE RELATIVITY GYROSCOPE EXPERIMENT Ph.D. Thesis
Thierry Georges Duhamel 1984 133 p
Avail: Univ. Microfilms Order No. DA8420517

Various aspects of the error analysis in the relativity gyroscope experiment were examined. This experiment is designed to measure the relativistic precessions of a gyroscope in orbit around the Earth. A Kalman filter in its square root form is used to estimate the precision on the relativistic precessions at the end of 1 year. An analytical averaging technique was used. The aberration of

starlight and the possibility of determination of the bending of starlight by the Sun by the Gyroscope experiment was examined. It is shown that it compares in precision with VLBI techniques. The dynamics of the gyroscope and the effects of elastic distortion due to centrifugal force are considered. When the gyroscope rotors are cooled through their superconducting transition temperature, the ambient magnetic field is trapped in the rotor. It is shown how the trapped flux signal at spin frequency can be used to calibrate the scale factor of the SQUID magnetometers.
Dissert. Abstr.

N85-14096# Department of the Army, Washington, D. C.
TORQUE SENSOR Patent Application
E. FGeppert, inventor (to Army) Filed 4 Sep. 1984 9 p
(AD-D011276; US-Patent-Appl-SN-647324) Avail: NTIS HC A02/MF A01 CSCL 13/9

Mechanical means for sensing turning torque generated by the load forces in a rotary drive system is described. The sensing means is designed to operate with minimal effect on normal operation of the drive system. The invention can be employed in various drive systems, e.g., automotive engine-transmission power plants, electric motor-operated tools, and metal cutting machines. In such drive systems, the torque-sensing feature may be useful for actuation of various control devices, such as electric switches, mechanical clutches, brake actuators, fluid control valves, or audible alarms. The torque-sensing function can be used for safety overload relief, motor de-energization, engine fuel control transmission clutch actuation, remote alarm signal, tool breakage signal, etc. GRA

N85-14097# Oak Ridge National Lab., Tenn.
ELECTRONIC AUTOFLUOROGRAPHY: PRINCIPLES, PROBLEMS AND PROSPECTS
J. B. Davidson 1984 19 p refs Presented at the 4th Inter. Meeting of the Electrophoresis Society, Gottingen, West Germany, 27 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE84-016698; CONF-840895-1) Avail: NTIS HC A02/MF A01

Detection principles of electronic autofluorography are described. A comparison with film is presented which indicates the gain in sensitivity and linearity of response obtainable by electronic means. Analog integration is compared with counting of individual particles, and the compatibility of the secondary electron conduction (SEC) camera tube with both modes is shown. Lens coupling and fiber optic coupling of the scintillator light to the intensifier are discussed, along with the desirability of the former in order to remove the gel size limitations of the available image intensifier with fiber optic inputs. It is concluded that the method is applicable to low-and high-energy betas as well as X-rays and, compared to film, can increase the speed of acquiring data from a gel by a factor of 100 to 1000. The possible application of the same camera to fluorescence from 2-D gels is briefly described. The future of the method appears promising. DOE

N85-14098# Los Alamos Scientific Lab., N. Mex.
CHARACTERIZATION OF ELECTRONIC STREAK TUBES INCLUDING ONE WITH INTERNAL CCD READOUT
P. B. Weiss, P. Black, H. Oona, and L. Sprouse 1984 15 p refs
(Contract W-7405-eng-36)
(DE84-016823; LA-UR-84-2598; CONF-840887-9) Avail: NTIS HC A02/MF A01

Measuring techniques for characterizing electronic streak tubes including dynamic range and resolution are described. A particular tube with a CCD imaging device within the envelope is described. DOE

N85-14099# European Space Agency, Paris (France).
EVALUATION OF THE STOCHASTIC DRIFT OF RATE-INTEGRATING GYROS AS PREPARATION FOR THE ANALYSIS OF LASER GYRO DRIFT MEASUREMENTS
Norbert Fuerstenau May 1984 36 p refs Transl. into ENGLISH of "Auswertung stochastischer Driften integrierender Wendekreisel als Vorbereitung auf die anal. von Driftmessungen an Lasericreiseln", DFVLR, Brunswick Rept. DFVLR-Mitt-83-04, 1983 Original report in GERMAN previously announced as N84-12449
(ESA-TT-827; DFVLR-Mitt-83-04) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 16

A method for evaluating long term drift measurements with inertial sensors was developed for stability tests of laser gyros. Data acquisition, and mathematical techniques for analyzing stochastic drifts are described. The interrelation of autocorrelation functions with mean squared fluctuations and physically explainable dissipative constants is emphasized. The method was assessed in stability tests of the rate-integrating gyros of a strapdown system. The limits of the method are discussed. Author (ESA)

N85-14100# Lange (Bruno) G.m.b.H., Berlin (West Germany).
MEASURING SYSTEM WITH ION SELECTIVE ELECTRODES Final Report, Mar. 1981
Klaus Ketterer and Brigitte Carl Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-170; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

For all-solid-state electrodes, long-life sodium, potassium, calcium and chloride sensitive polymeric membranes were developed. Flow cell type electrode modules and an experimental analytical instrument were constructed. System control and error indication are obtained with a BASIC computer. The instrument is suitable for analyzing aqueous solutions in medicine or environmental protection. Author (ESA)

N85-14101# Litton Technische Werke, Freiburg (West Germany).
DEVELOPMENT PROGRAM: NUCLEAR MAGNETIC RESONANCE GYROSCOPE (NMR-GYRO). PHASE 1: DEVELOPMENT OF AN EXPERIMENTAL MODEL Final Report, Dec. 1983
Wolfram Ebert, Hanns-Juergen Bueschelberger, Peter Groellmann, and Christopher Noxon Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 118 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-041; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25

Development of a nuclear magnetic resonance (NMK) gyroscope is described. A low cost, low accuracy configuration of a NMR-gyro was selected. A comprehensive error model for this gyro was derived. An experimental model was constructed, and the fundamental physical process and states necessary for the functioning of the gyro were studied. The gyro is expected to become a low cost, resilient alternative to conventional gyros.
Author (ESA)

N85-14102# Ecole Nationale Superieure des Telecommunications, Paris (France).
STUDY AND REALIZATION OF A DOPPLER SYSTEM WITH PULSED, DIRECTIONAL, MULTIPORT (128) EMISSION AND SEQUENTIAL SIGNAL TREATMENT Ph.D. Thesis [ETUDE ET REALISATION D'UN SYSTEME DOPPLER PULSE MULTI-PORTE (128) DIRECTIONAL, A TRAITEMENT DE SIGNAL SEQUENTIEL]
Young-Kil Kim 19 Jun. 1984 170 p refs In FRENCH
(ENST-84E008; ISSN-0751-1353) Avail: NTIS HC A08/MF A01

A Doppler echography system is described. A transducer is used alternatively as emitter and receptor. A Doppler signal is obtained at the output of a phase detector. A moving target indicator circuit is used to suppress the fixed echoes around the repetition frequency in the phase signal spectrum. A directional frequence meter gives the system output. The most important characteristics of the apparatus are the precise definition of the zero velocity level, the ability to detect the flow direction, the instantaneous output and the possibility to follow velocity variations along the cardiac cycle. Author (ESA)

N85-13781# Surrey Univ., Guildford (England).
EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION FOR BLUFF BODY AERODYNAMICS
A. Hunt *In* Von Karman Inst. for Fluid Dyn. Flow Around Bluff Bodies: Numer. and Exptl. Approaches 1984 32 p refs (For primary document see N85-13778 05-02)
Avail: NTIS HC A14/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-14103# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMIC TESTING OF NOVA LASER SWITCHYARD TOWER
H. Joseph Weaver, John W. Pasternak, and Douglas E. Fields 1 Jun. 1984 38 p refs
(Contract W-7405-eng-48)
(DE84-014450; UCID-20102) Avail: NTIS HC A03/MF A01

NOVA is the latest in a series of powerful laser systems designed to study the feasibility of initiating a controlled fusion reaction by concentrating several laser beams on a small fuel target. The laser components, turning mirrors and target chamber are all mounted on large steel frame structures. These structures were analyzed via finite element models to access their seismic integrity and their overall vibrational stability. When construction was completed, a modal analysis was performed on the structures to verify and improve the finite element models. The linking of the analytical and experimental studies for the NOVA switchyard tower structure is discussed. DOE

N85-14104# Los Alamos Scientific Lab., N. Mex.
QUALITY ASSURANCE IN THE ANTARES LASER FUSION CONSTRUCTION PROJECT
Walter H. Reichelt 1984 17 p Presented at the ASOC 11th Ann. Natl. Energy Div. Conf., Las Vegas, Nev., 16-19 Sep. 1984
(Contract W-7405-eng-36)
(DE84-015493; LA-UR-84-2074; CONF-840996-2) Avail: NTIS HC A02/MF A01

The Antares CO2 laser facility came on line in November 1983 as an experimental physics facility; it is the world's largest CO2 laser fusion system. Antares is a major component of the Department of Energy's Inertial Confinement Fusion Program. Antares is a one-of-a kind laser system that is used in an experimental environment. Given limited project funds and tight schedules, the quality assurance program was tailored to achieve project goals without imposing oppressive constraints. The discussion will review the Antares quality assurance program and the utility of various portions to completion of the project. DOE

N85-14105# Boston Univ., Mass. Dept. of Physics.
REFRACTIVE INDEX OF TERNARY AND QUATERNARY COMPOUND SEMICONDUCTORS BELOW THE FUNDAMENTAL ABSORPTION EDGE: LINEAR AND NONLINEAR EFFECTS
B. Jensen and A. Torabi 1983 19 p refs Presented at the Symp. on Opt. Mater. for High Power Lasers, Boulder, Colo., 14 Nov. 1983
(Contract DE-AC02-79ER-10444)
(DE84-012325; DOE/ER-10444/8; CONF-8311146-5) Avail: NTIS HC A02/MF A01

The index of refraction n is calculated as a function of frequency and mole fraction x for the following compounds: Hg/sub 1-x/Cd/sub x/Te, Al/sub x/Ga/sub 1-x/As, and In/sub 1-x/Ga/sub x/As/sub y/P/sub 1-x/ lattice matched to InP. Lattice matching of In/sub 1-x/Ga/sub x/As/sub y/P/sub 1-y/ to InP requires that x = 0.466 y. The theoretical result for the refractive index is obtained from a quantum mechanical calculation of the dielectric constant of a compound semiconductor. It is given in terms of the basic material parameters of band gap energy, effective electron mass m/sub n/, effective heavy hole mass m/sub p/, spin orbit splitting energy, lattice constant, and carrier concentration n/sub e/ or p for n type or p type materials, respectively. If these quantities are known as functions of mole fraction x, there are no adjustable parameters involved. A negative change in the refractive index near the fundamental absorption edge is predicted on passing radiation through a crystal if the change in carrier concentration of the initially unoccupied conduction band is assumed proportional to internal intensity 1. DOE

N85-14106# Chicago Univ., Ill. Dept. of Physics.
FOCUSSING AND CONFINEMENT
U. Fano 1983 12 p refs
(Contract DE-AC02-76ER-01674)
(DE84-016181; DOE/ER-01674/9) Avail: NTIS HC A02/MF A01

The confinement of resonant states astride the ridge of potential barriers, evidenced by observations of collisions and spectra, stems from the propagation of WKB wave functions singled out by their asymptotic behavior. The same effect occurs in diverse phenomena including self focusing of laser beams. DOE

N85-14107# Los Alamos Scientific Lab., N. Mex.
SIMULATION OF THE INTERACTION OF SINGLE-PULSED OPTICAL LASERS WITH TARGETS IN A VACUUM
S. R. Goldman, G. H. Canavan, R. S. Dingus, and M. A. Mahaffy 1984 7 p refs Presented at 5th Intern. Symp. on Gas Flow and Chem. Lasers, Oxford, 20 Aug. 1984
(Contract W-7405-eng-36)
(DE84-016476; LA-UR-84-2555; CONF-840899-2) Avail: NTIS HC A02/MF A01

Computer simulations are presented of the interaction of perturbed laser beam on an aluminum target at pulse widths from .05 to 2.0 microsec, and intensities from 5 x 10 to the 7th power to 5 x 10 to the 13th power W/sq cm, at laser wavelengths varying from 0.25 micrometers (KrF laser) to 10.6 micrometers (CO2 laser). Focus is on impulse coupling and identifying the critical processes for momentum generation. Uncertainties in modeling are discussed. DOE

N85-14108# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Kreiselgeraete und Traegheitsnavigation.
CLEANING PROCEDURES OF LASER MIRROR SUBSTRATES
Rolf Gauert and Helmut Rosteck Apr. 1984 25 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-84-06) Avail: NTIS HC A02/MF A01

Manual and ultrasonic methods for cleaning laser mirror substrates were examined using dark field microscopy and integral backscattering measurements. Manual cleaning using acetone, cotton and grease free Josefs paper and ultrasonic cleaning for 27 min in acetone are recommended. Author (ESA)

N85-14109# AEG-Telefunken, Frankfurt am Main (West Germany). Forschunginst.
LASER DIODES FOR INFRARED SPECTROSCOPY Final Report, Dec. 1980
Axel Heime, Heinz Henkel, Roland Herkert, Brigitte Junkersfeld, Werner Maier, Harald Matthes, Ingrid Meier, Herbert Pfeiffer, Hans Dieter Wurzinger, Roland Grisard (Fraunhofer- Institut fuer Physikalische Messtechnik) et al Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 104 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-131; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22

For the spectral range of 8 to 20 microns, PbSnSe diode lasers were manufactured. To obtain the pn-transitions cadmium was diffused into PbSnSe. With given Pb1-x Snx Se substrate parameters and chosen diffusion parameters, maximum operating temperature, mode behavior and output power of the laser can be controlled. For lasers for the range 2.5 to 4 microns, heterostructures based on PbCdS were prepared by hot-wall epitaxy. Suitable contact materials were found. The sublimation growth for the

production of PbSnSe and PbCdS crystal substrates was standardized. Author (ESA)

N85-14110# Technische Hochschule, Aachen (West Germany). Lab. fuer Werkzeugmaschinen und Betriebslehre.
MODULAR LASER DISTANCE MEASUREMENT SYSTEM FOR MULTIAXIS MACHINE TOOLS Final Report, Dec. 1980
Tilo Pfeifer and Eugen Trapet Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 82 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-166; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

Economic application of laser interferometers for distance measurement with machine tools was studied. Prototypes were tested. The experiment shows extreme accuracy under workshop conditions, for high precision machine tools. Economic advantages compared with glass scales are given for total distance 3 to 10 m, depending on the number of axes. Measurement accuracy is not subject to temperature fluctuations. Author (ESA)

N85-14652# Joint Publications Research Service, Arlington, Va.
LASER EXCITATION OF COUPLED SURFACE ELECTROMAGNETIC AND ACOUSTIC WAVES AND OF STATIC STRUCTURES IN SOLIDS Abstract Only
V. I. Yemelyanov and V. N. Seminogov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 5 refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), v. 86, no. 3, Mar. 1984 p 1026-1036 Original language document announced as A84-31011 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

N85-14660# Joint Publications Research Service, Arlington, Va.
OVERVIEW OF RECENT ADVANCES IN LASER APPLICATIONS
N. G. Basov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 26-30 Transl. in ENGLISH from Trud (Moscow), no. 89 (19236), 15 Apr. 1984 p 2 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

N85-14661# Joint Publications Research Service, Arlington, Va.
TRANSFORMATION OF ENERGY SPREAD OF LASER PUMPING VIA PHASE CONJUGATION Abstract Only
V. M. Arutyunyan, S. A. Agadzanyan, A. Zh. Muradyan, and T. A. Papazyan *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 32 refs Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR, Fiz. (Yerevan, USSR), v. 19, no. 2, Mar. - Apr. 1984 p 81-85 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-14111 British Library Lending Div., Boston Spa (England).
SOLVING EQUATIONS OF MOVEMENT WITH VARIABLE INERTIA MOMENT
V. F. Egorov, V. I. Lyulenkov, A. S. Shinkarenko, and O. M. Goncharov 7 Nov. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 4, 1984 p 127-128
(BLL-M-35975-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A simplified formula is suggested based on the use of conditions of kinetostatic equilibrium of mechanism elements taking into account the character of movement of individual elements subject to dynamic loads. Author

N85-14112 Polish Academy of Sciences, Warsaw. Zaklad Akustyki Cybernetyoznej.
VIBROACOUSTIC CONTROL DIAGNOSTICS OF SELECTED MACHINES BASED ON RESEARCH ON THE SLIDE BEARING OF AN AUTOMOBILE ENGINE AND THE ALTERNATOR [WIBROAKUSTYCZNA DIAGNOSTYKA KONTROLNA WYBRANYCH MASZYN NA PRZYKLADZIE BADAN LOZYSKA SLIZGOWEGO SILNIKA SAMOCHODOWEGO ORAZ ALTERNATORA]
Jerzy Motylewski and Dariusz Nitecki 1983 51 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

A general method of noise control and acoustic diagnostics of automobiles is proposed. Conceptual and functional assumptions of an apparatus that measures the vibroacoustics of selected machines are reviewed. The method is applied to the control diagnostics of automobile engines (slide bearings) and their subassemblies (alternators). Illustrations of the application of the proposed method confirm the suitability of using a vibroacoustic signal as a carrier of information about the technical state of devices. Transl. by B.G.

N85-14113 Florida Univ., Gainesville.
INSTANTANEOUS KINEMATICS AND JOINT DISPLACEMENT ANALYSIS OF FULLY-PARALLEL ROBOTIC DEVICES Ph.D. Thesis
Maher Gaber Mohamed 1983 325 p
Avail: Univ. Microfilms Order No. DA8420351

Parallel devices are studied in industry as potential robot manipulators to provide a basic understanding and to assess some of the practical aspects. A type synthesis of parallel robotic devices is performed using an algorithm based on Franke's condensed notation, potential robotic applications are discussed. Two topics are discussed: instantaneous kinematics and joint displacement analysis of fully-parallel devices. Two novel procedures to determine the instantaneous motion of the end effector platform of fully parallel devices using the theory of screws are presented and an important theorem is derived for any parallel device, the twist representing the instantaneous motion of the end effector platform is equal to the sum of its partial twists. A characteristic matrix equation is used to describe and categorize various geometrical phenomena call special configurations. Six different types of special configurations are tabulated. Special configurations of the planar Florida Shoulder are studied and numerical results are provided. The joint displacement analysis of the planar Florida Shoulder is presented. The reverse joint displacement analysis of the well known Stewart Platform and also of the R-P-SP spatial robotic device with three subchains connecting the end effector platform are presented. Computer programs for the displacement analysis are listed in the appendices. Dissert. Abstr.

N85-14114 Massachusetts Univ., Amherst.
THE ACQUISITION, PROCESSING, AND USE OF TACTILE SENSOR DATA IN ROBOT CONTROL
Kenneth Jackson Overton 1984 353 p
Avail: Univ. Microfilms Order No. DA8418899

The development of a sense of touch for robot systems is addressed. Robot senses are discussed and a classification scheme developed with particular attention paid to the definition of tactile sensors. Current tactile sensors in use in laboratories are presented along with the design of the sensor developed in this work. Issues surrounding the response characteristics of the sensor and static and dynamic tactile image processing are presented and several experiments discussed. An approach to the utilization of sensory information in high level control provides the topic for the chapter on schemas. Conclusions drawn from this work as well as directions for future research in tactile sensation are provided in the final section and appendices. Dissert. Abstr.

N85-14115*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE VARIABLE POLARITY PLASMA ARC WELDING PROCESS: ITS APPLICATION TO THE SPACE SHUTTLE EXTERNAL TANK

Interim Report
A. C. Nunes, Jr., E. O. Bayless, Jr., and W. A. Wilson Nov. 1984 23 p
(NASA-TM-86482; NAS 1.15:86482; IR-2) Avail: NTIS HC A02/MF A01 CSCL 13H

This report describes progress in the implementation of the Variable Polarity Plasma Arc Welding (VPPAW) process at the External Tank (ET) assembly facility. Design allowable data has been developed for thicknesses up to 1.00 in. More than 24,000 in. of welding on liquid oxygen and liquid hydrogen cylinders has been made without an internal defect. Author

N85-14116*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROTORDYNAMIC INSTABILITY PROBLEMS IN HIGH-PERFORMANCE TURBOMACHINERY
Washington Dec. 1984 507 p refs Workshop held in College Station, Tex., 28-30 May 1984; sponsored by Texas A&M Univ., Army Research Office, and the Air Force Aeropropulsion Lab.
(NASA-CP-2338; E-2214; NAS 1.55:2338) Avail: NTIS HC A22/MF A01 CSCL 13I

Rotordynamics and predictions on the stability of characteristics of high performance turbomachinery were discussed. Resolutions of problems on experimental validation of the forces that influence rotordynamics were emphasized. The programs to predict or measure forces and force coefficients in high-performance turbomachinery are illustrated. Data to design new machines with enhanced stability characteristics or upgrading existing machines are presented. For individual titles, see N85-14117 through N85-14141.

N85-14117*# Exxon Research and Engineering Co., Florham Park, N.J.
FULL LOAD TESTING IN THE PLATFORM MODULE PRIOR TO TOW-OUT: A CASE HISTORY OF SUBSYNCHRONOUS INSTABILITY
J. W. Fulton *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 1-16 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

An electric motor driven centrifugal compressor to supply gas for further compression and reinjection on a petroleum production platform in the North Sea was examined. The compressor design, raised concerns about susceptibility to subsynchronous instability. Log decrement, aerodynamic features, and the experience of other compressors with similar ratios of operating to critical speed ratio versus gas density led to the decision to full load test. Mixed hydrocarbon gas was chosen for the test to meet discharge temperature restrictions. The module was used as the test site. Subsynchronous vibrations made the compressor inoperable above approximately one-half the rated discharge pressure of 14500 kPa. Modifications, which includes shortening the bearing span, change of leakage inlet flow direction on the back to back labyrinth, and removal of the vaned diffusers on all stages were made simultaneously. The compressor is operating with satisfactory vibration levels. E.A.K.

N85-14118*# Southwest Research Inst., San Antonio, Tex.
SUBSYNCHRONOUS VIBRATIONS IN A HIGH PRESSURE CENTRIFUGAL COMPRESSOR: A CASE HISTORY
B. F. Evans and A. J. Smalley *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 17-36 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

Two distinct aerodynamically excited vibrations in a high pressure low flow centrifugal compressor are documented. A measured vibration near 21% of running speed was identified as a nonresonant forced vibration which results from rotating stall in the diffuser; a measured vibration near 50% of running speed was identified as a self excited vibration sustained by cross coupling forces acting at the compressor wheels. The dependence of these characteristics on speed, discharge pressure, and changes in bearing design are shown. The exciting mechanisms of diffuser stall and aerodynamic cross coupling are evidenced. It is shown how the rotor characteristics are expected to change as a result of modifications. The operation of the compressor after the modifications is described. E.A.K.

N85-14119*# Engineering Dynamics, Inc., San Antonio, Tex.
EXPERIENCES WITH NONSYNCHRONOUS FORCED VIBRATION IN CENTRIFUGAL COMPRESSORS
D. R. Smith and J. C. Wachel *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 37-52 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

The high subsynchronous vibrations which are often forced vibrations caused by flow instabilities, such as stage stall were examined. Modifications to improve the rotor stability by changing the bearings or seals have little effects on the subsynchronous vibrations. Understanding of the differences between forced vibrations and self excited vibrations to properly diagnose the problem and to correct it, is recommended. A list of characteristics of the two types of subsynchronous vibration is presented. E.A.K.

N85-14120*# Avco Lycoming Div., Stratford, Conn.
CONTROL OF ROTORDYNAMIC INSTABILITY IN A TYPICAL GAS TURBINE'S POWER SYSTEM
Nicholas M. Veikos, Richard H. Page, and Edward J. Tornillo *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 53-80 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

The effect of rotor internal friction on the system's stability was studied when operated above the first critical speed. This internal friction is commonly caused by sliding press fits or sliding splines. Under conditions of high speed and low bearing damping, these systems will occassionally whirl at a frequency less than the shaft's rotational speed. This subsynchronous precession is a self excited phenomenon and stress reversals are created. This phenomenon was observed during engine testing. The reduction of spline friction and/or the inclusion of squeeze film damping have controlled the instability. Case history and the detail design of the squeeze film dampers is discussed. E.A.K.

N85-14121*# Exxon Chemical Co., Inc., Baytown, Tex.
EXPERIMENTAL ON-STREAM ELIMINATION OF RESONANT WHIRL IN A LARGE CENTRIFUGAL COMPRESSOR
G. I. Bhat and R. G. Eierman *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 81-95 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

Resonant whirl condition during operation of a multi-stage centrifugal compressor at higher than anticipated speeds and loads was reported. The condition was diagnosed by a large scale computerized Machinery Condition Monitoring System (MACMOS). This computerized system verified that the predominant subsynchronous whirl frequency locked in on the first resonant frequency of the compressor rotor and did not vary with compressor speed. Compressor stability calculations showed the rotor system had excessive hearing stiffness and inadequate effective damping. An optimum bearing design which was developed to minimize the unbalance response and to maximize the stability threshold is presented. E.A.K.

N85-14122*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERNAL HYSTERESIS EXPERIENCED ON A HIGH PRESSURE SYN GAS COMPRESSOR
F. Y. Zeidan (Qatar Fertiliser Co., Umm Said) *In its* Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 97-108 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

A vibration instability phenomenon experienced in operating

high pressure syn gas centrifugal compressors in two ammonia plants is described. The compressors were monitored by orbit and spectrum analysis for changes from baseline readings. It is found that internal hysteresis was the major destabilizing force; however, the problem was further complicated by seal lockup at the suction end of the compressor. A coupling lockup problem and a coupling fit problem, which frettage of the shaft, are also considered as contributors to the self excited vibrations. E.A.K.

N85-14123*# California Inst. of Tech., Pasadena.
LATERAL FLUID FORCES ACTING ON A WHIRLING CENTRIFUGAL IMPELLER IN VANELESS AND VANED DIFFUSER
Hideo Ohashi and Hidenobu Shoji (Tsukuba Univ., Japan) *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 109-122 (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

Fluid forces on a rotating centrifugal impeller in whirling motion were studied. A two dimensional impeller installed in a parallel-walled vaneless and vaned diffuser whirled on a circular orbit with various positive and negative angular velocities. It is shown that the fluid forces exert a damping effect on the rotor in most operating conditions, but become excitatory when the impeller operates at very low partial discharge while rotating far faster than the whirl speed. The fluid forces were expressed in terms of mass, damping and stiffness matrices. Impellers with the same geometry and whirl condition are calculated. Quantitative agreement is obtained especially in positive whirl. E.A.K.

N85-14124*# Virginia Univ., Charlottesville.
HYDRAULIC FORCES ON A CENTRIFUGAL IMPELLER UNDERGOING SYNCHRONOUS WHIRL
Paul E. Allaire, Cheryl J. Sato (BE & IC Enginnering Co., Birmingham, Ala.), and Lyle A. Branagan (Pacific Gas and Electric Co., San Ramon, Calif.) *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 123-136 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

High speed centrifugal rotating machinery with large vibrations caused by aerodynamic forces on impellers was examined. A method to calculate forces in a two dimensional orbiting impeller in an unbounded fluid with nonuniform entering flow was developed. A finite element model of the full impeller is employed to solve the inviscid flow equations. Five forces acting on the impeller are: Coriolis forces, centripetal forces, changes in linear momentum, changes in pressure due to rotation and pressure changes due to linear momentum. Both principal and cross coupled stiffness coefficients are calculated for the impeller. E.A.K.

N85-14125*# California Inst. of Tech., Pasadena.
HYDRODYNAMIC IMPELLER STIFFNESS, DAMPING, AND INERTIA IN THE ROTORDYNAMICS OF CENTRIFUGAL FLOW PUMPS
S. Jery, A. J. Acosta, C. E. Brennen, and T. K. Caughey *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 137-160 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

The lateral hydrodynamic forces experienced by a centrifugal pump impeller performing circular whirl motions within several volute geometries were measured. The lateral forces were decomposed into: (1) time averaged lateral forces and (2) hydrodynamic force matrices representing the variation of the lateral forces with position of the impeller center. It is found that these force matrices essentially consist of equal diagonal terms and skew symmetric off diagonal terms. One consequence of this is that during its whirl motion the impeller experiences forces acting normal and tangential to the locus of whirl. Data on these normal and tangential forces are presented; it is shown that there exists a region of positive reduced whirl frequencies, within which the hydrodynamic forces can be destablizing with respect to whirl. E.A.K.

N85-14126*# Osaka Univ. (Japan).
TWO-DIMENSIONAL UNSTEADY ANALYSIS OF FLUID FORCES ON A WHIRLING CENTRIFUGAL IMPELLER IN A VOLUTE
Y. Tsujimoto, A. J. Acosta (California Inst. of Tech., Pasadena), and C. E. Brennen (California Inst. of Tech., Pasadena) *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 161-172 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

Destabilizing fluid forces on a whirling centrifugal impeller rotating in a volute were observed. A quasisteady analysis neglecting shed vorticity or an unsteady analysis without a volute does not predict the existence of such destabilizing fluid forces on a whirling impeller. The effects of a volute and the shed vorticity are considered. We treat cases when an impeller with an infinite number of vanes rotates with a constant velocity omega and its center whirls with a constant eccentric radius epsilon and a constant whirling velocity psi. It is assumed that: (1) the number of the vanes is so large that the impeller can be treated as an actuator impeller in which the flow is perfectly guided; (2) flow is inviscid, incompressible and two dimensional; (3) the eccentricity epsilon is so small that unsteady components can be linearized; (4) vorticity is transported on a prescribed mean flow, the operating point is near design flow rate; and (5) the volute can be represented by a curved plate. E.A.K.

N85-14127*# Kobe Steel Ltd. (Japan).
THEORETICAL APPROACH TO LABYRINTH SEAL FORCES - CROSS-COUPLED STIFFNESS OF A STRAIGHT-THROUGH LABYRINTH SEAL
Toshio Kameoka, Toru Abe, and Takeshi Fujikawa *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 173-186 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

Two kinds of three dimensional flows in a labyrinth seal, a jet flow and a core flow, are considered and theoretical equations are set up concerning the motion of each flow. The pressure distribution within the labyrinth is calculated, when the rotor shaft makes a small displacement from the center line of the casing, keeping parallel with it. The theoretical values of cross coupled stiffness obtained by integrating the pressure under different labyrinth geometries and operating conditions through these formulas are compared with the experimental data. E.A.K.

N85-14128*# Heriott-Watt Univ., Edinburgh (Scotland).
EXPERIMENTAL INVESTIGATION OF LATERAL FORCES INDUCED BY FLOW THROUGH MODEL LABYRINTH GLANDS
Y. M. M. Salman Leong (Universiti Teknologi Malaysia, Juan Gurney, Kuala Lumpur) and R. David Brown *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 187-210 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

The lateral forces induced by flow through model labyrinth glands were investigated. Circumferential pressure distributions, lateral forces and stiffness coefficients data obtained are discussed. The force system is represented as a negative spring and a tangential force orthogonal to eccentricity. The magnitude of these forces are dependent on eccentricity, entry swirl, rotor peripheral velocity and seal size. A pressure equalization chamber at midgland tests should in significantly reduced forces and stiffness coefficients. E.A.K.

N85-14129*# Kobe Univ. (Japan).
ANALYSIS OF DYNAMIC CHARACTERISTICS OF FLUID FORCE INDUCED BY LABYRINTH SEAL
Takuzo Iwatsubo, Ryoji Kawai, Naoya Kagawa, Tetsuya Kakiuchi, and Kazuki Takahara *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 211-234 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

Flow patterns of the labyrinth seal are experimentally investigated for making a mathematical model of labyrinth seal and to obtain the flow induced force of the seal. First, the flow patterns in the labyrinth chamber are studied on the circumferential flow using bubble and on the cross section of the seal chamber using aluminum powder as tracers. And next, the fluid force and its phase angle are obtained from the measured pressure distribution in the chamber and the fluid force coefficients are derived from the fluid force and the phase angle. Those are similar to the expression of oil film coefficients. As a result, it is found that the vortices exist in the labyrinth chambers and its center moves up and down periodically. The pressure drop is biggest in the first stage of chambers and next in the last stage of chambers. Author

N85-14130*# Massachusetts Inst. of Tech., Cambridge.
PREDICTION OF FORCE COEFFICIENTS FOR LABYRINTH SEALS
Otto W. K. Lee, M. Martinez-Sanchez, and Eva Czajkowski *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 235-256 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

The development of a linear model for the prediction of labyrinth seal forces and on its comparison to available stiffness data is presented. A discussion of the relevance of fluid damping forces and the preliminary stages of a program to obtain data on these forces are examined. Fluid-dynamic forces arising from nonuniform pressure patterns in labyrinth seal glands are known to be potentially destablizing in high power turbomachinery. A well documented case in point is that of the space Shuttle Main Engine turbopumps. Seal forces are also an important factor for the stability of shrouded turbines, acting in that case in conjunction with the effects of blade-tip clearance variations. B.G.

N85-14131*# Texas A&M Univ., College Station.
AN IWATSUBO-BASED SOLUTION FOR LABYRINTH SEALS - COMPARISON WITH EXPERIMENTAL RESULTS
Dara W. Childs and Joseph K. Scharrer *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 257-280 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

The basic equations are derived for compressible flow in a labyrinth seal. The flow is assumed to be completely turbulent in the circumferential direction where the friction factor is determined by the Blasius relation. Linearized zeroth and first-order perturbation equations are developed for small motion about a centered position by an expansion in the eccentricity ratio. The zeroth-order pressure distribution is found by satisfying the leakage equation while the circumferential velocity distribution is determined by satisfying the momentum equation. The first-order equations are solved by a separation of variables solution. Integration of the resultant pressure distribution along and around the seal defines the reaction force developed by the seal and the corresponding dynamic coefficients. The results of this analysis are compared to published test results. Author

N85-14132*# General Electric Co., Schenectady, N. Y.
PRELIMINARY INVESTIGATION OF LABYRINTH PACKING PRESSURE DROPS AT ONSET OF SWIRL-INDUCED ROTOR INSTABILITY
E. H. Miller and J. H. Vohr *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 281-294 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

Backward and forward subsynchronous instability was observed in a flexible model test rotor under the influence of swirl flow in a straight-through labyrinth packing. The packing pressure drop at the onset of instability was then measured for a range of operating speeds, clearances and inlet swirl conditions. The trend in these measurements for forward swirl and forward instability is generally consistent with the short packing rotor force formulations of Benchert and Wachter. Diverging clearances were also destabilizing and had a forward orbit with forward swirl and a backward orbit with reverse swirl. A larger, stiff rotor model system is now being assembled which will permit testing steam turbine-type straight-through and hi-lo labyrinth packings. With calibrated and adjustable bearings in this new apparatus, direct measure of the net destabilizing force generated by the packings can be made. Author

N85-14133*# Kaiserslautern Univ. (West Germany).
IDENTIFICATION OF DYNAMIC COEFFICIENTS OF ANNULAR TURBULENT SEALS
Rainer Nordmann and Harald Massmann *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 295-312 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

An identification procedure to determine dynamic coefficients of annular turbulent seals in turbopumps is presented. Measurements were carried out at a built test rig with two symmetrical arranged seals. A rigid rotating shaft is surrounded by an elastically supported housing, which is excited by impact forces. The relative radial motion between the rotating parts and the housing, respectively between the seal surfaces, is measured by displacement pick-ups and from the time signals complex frequency response functions can be calculated. Finally an analytical model, depending on the seal parameters, is fitted to the measured data, to find the dynamic coefficients. Author

N85-14134*# Texas A&M Univ., College Station.
ANALYSIS AND TESTING FOR ROTORDYNAMIC COEFFICIENTS OF TURBULENT ANNULAR SEALS WITH DIFFERENT, DIRECTIONALLY HOMOGENEOUS SURFACE-ROUGHNESS TREATMENT FOR ROTOR AND STATOR ELEMENTS
D. W. Childs and Chang-Ho Kim *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 313-340 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

A theory is presented, based on a simple modification of Hirs' turbulent lubrication equations, to account for different but directionally-homogeneous surface roughness treatments for the rotor and stator of annular seals. The theoretical results agree with von Pragenau's predictions that a damper seal which uses a smooth rotor and a rough stator yields more net damping than a conventional seal which has the same roughness for both the rotor and stator. Experimental results for four stators confirm that properly-designed roughened stators yield higher net damping values and substantially less leakage than seals with smooth surfaces. The best seal from both damping and leakage viewpoints uses a round-hole-pattern stator. Initial results for this stator suggest that, within limits, seals can be designed to yield specified ratios of stiffness to damping. Author

N85-14135*# Texas A&M Univ., College Station.
ANALYSIS FOR LEAKAGE AND ROTORDYNAMIC COEFFICIENTS OF SURFACE ROUGHENED TAPERED ANNULAR GAS SEALS
C. C. Nelson *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 341-350 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 11A

In order to soften the effects of rub, the smooth stators of turbine gas seals are sometimes replaced by a honeycomb surface. This deliberately roughened stator and smooth rotor combination retards the seal leakage and may lead to enhanced rotor stability. However, many factors determine the rotordynamic coefficients and little is known as to the effectiveness of these honeycomb seals under various changes in the independent seal parameters. An analytical-computational method to solve for the rotordynamic coefficients of this type of compressible-flow seal is developed.

The governing equations for surface roughned tapered annular gas seals are based on a modified Hirs' turbulent bulk flow model. A perturbation analysis is employed to develop zeroth and first-order perturbation equations. These equations are numerically integrated to solve for the leakage, pressure, density, and velocity for small motion of the shaft about the centered position. The resulting pressure distribution is then integrated to find the corresponding rotor-dynamic coefficients. Author

N85-14136*# Eidgenoessische Technische Hochschule, Zurich (Switzerland).
DESIGN OF ELECTROMAGNETIC BEARING FOR VIBRATION CONTROL OF FLEXIBLE TRANSMISSION SHAFT
V. Gondhalekar and R. Holmes (Southampton Univ., England) *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 351-364 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

Recently magnetic bearings were proposed by several researchers and shown to be viable on a variety of rotor assemblies. The design and construction of such a bearing, which employs features hitherto not used by other workers is examined. These include an original approach to the design of the electromagnets and their amplifiers, and to software in a digital control system, to condition the control signals so as to make the magnets appear to be linear and uncoupled. The resulting system is used to control a rotor-bearing assembly, whose speed range covers two flexural-critical speeds. Author

N85-14137*# Texas A&M Univ., College Station.
EFFECTS OF FLUID INERTIA AND TURBULENCE ON FORCE COEFFICIENTS FOR SQUEEZE FILM DAMPERS
Luis San Andres and John M. Vance *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 365-390 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 20D

The effects of fluid inertia and turbulence on the force coefficients of squeeze film dampers are investigated analytically. Both the convective and the temporal terms are included in the analysis of inertia effects. The analysis of turbulence is based on friction coefficients currently found in the literature for Poiseuille flow. The effect of fluid inertia on the magnitude of the radial direct inertia coefficient (i.e., to produce an apparent added mass at small eccentricity ratios, due to the temporal terms) is found to be completely reversed at large eccentricity ratios. The reversal is due entirely to the inclusion of the convective inertia terms in the analysis. Turbulence is found to produce a large effect on the direct damping coefficient at high eccentricity ratios. For the long or sealed squeeze film damper at high eccentricity ratios, the damping prediction with turbulence included is an order of magnitude higher than the laminar solution. Author

N85-14138*# New South Wales Univ., Kensington (Australia).
SQUEEZE-FILM DAMPERS FOR TURBOMACHINERY STABILIZATION
L. J. McLean and E. J. Hahn *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 391-406 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

A technique for investigating the stability and damping present in centrally preloaded radially symmetric multi-mass flexible rotor bearing systems is presented. In general, one needs to find the eigenvalues of the linearized perturbation equations, though zero frequency stability maps may be found by solving as many simultaneous non-linear equations as there are dampers; and in the case of a single damper, such maps may be found directly, regardless of the number of degrees of freedom. The technique is illustrated for a simple symmetric four degree of freedom flexible rotor with an unpressurized damper. This example shows that whereas zero frequency stability maps are likely to prove to be a simple way to delineate multiple solution possibilities, they do not provide full stability information. Further, particularly for low bearing parameters, the introduction of an unpressurized squeeze film damper may promote instability in an otherwise stable system. Author

N85-14139*# Southampton Univ. (England).
DAMPING CAPACITY OF A SEALED SQUEEZE FILM BEARING
M. M. Dede, M. Dogan, and R. Holmes *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 407-428 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

The advantages of incorporating an open-ended or weakly-sealed squeeze-film bearing in a flexible support structure simulating an aero-engine assembly were examined. Attention is given to empirically modelling the hydrodynamics of the more usual tightly-sealed squeeze-film bearing, with a view to assessing its damping performance. Author

N85-14140*# Nuovo Pignone S.p.A., Florence (Italy).
INFLUENCE OF STATIONARY COMPONENTS ON UNSTEADY FLOW IN INDUSTRIAL CENTRIFUGAL COMPRESSORS
Luciano Bonciani and Luciano Terrinoni *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 429-480 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 20D

An experimental investigation was performed to determine the characteristics of the onset and the growth of rotating nonuniform flow in a standard low specific speed stage, normally utilized in high pressure applications, in relation to change of stationary component geometry. Four configurations, differing only in the return channel and crossover geometry were tested on an atmospheric pressure open loop test rig. Experimental results make conspicious the effect of return channel geometry and give the possibility of shifting the unstable zone onset varying such geometry. An attempt was made to interpret the experimental results in the Emmons - Stenning's rotating stall theory. Author

N85-14141*# Bently Nevada Corp., Minden.
DYNAMIC STIFFNESS CHARACTERISTICS OF HIGH ECCENTRICITY RATIO BEARINGS AND SEALS BY PERTURBATION TESTING
Donald E. Bently and Agnes Muszynska *In* NASA. Lewis Research Center Rotordynamic Instability Problems in High-Performance Turbomachinery Dec. 1984 p 481-501 refs (For primary document see N85-14116 05-37)
Avail: NTIS HC A22/MF A01 CSCL 13I

The complex behavior of cylindrical bearings and seals that are statically loaded to eccentricities in excess of 0.7 are examined. The stiffness algorithms as a function of static load are developed from perturbation methodology by empirical modeling. Author

N85-14142# Department of the Army, Washington, D. C.
VEHICLE-TO-VEHICLE CONNECTION MECHANISM Patent Application
J. L. Celentino, inventor (to Army) Filed 2 Aug. 1984 11 p (AD-D011267; US-Patent-Appl-SN-637250) Avail: NTIS HC A02/MF A01 CSCL 13/6

A device for temporarily attaching two vehicles to form a united structure is disclosed. The device has a rod which extends from the first vehicle into a complimentary grasping means on the second vehicle. The grasping means can be activated to hold the rod firmly so retraction towards the first vehicle will draw the vehicles together. GRA

N85-14143# Sandia Labs., Albuquerque, N. Mex. Switching Devices Div.
MC2969 ESCAPEMENT STUDY
Michael G. Orrell Jun. 1984 56 p refs
(Contract DEAC04-76DP-00789)
(DE84-014542; SAND-84-0193) Avail: NTIS HC A04/MF A01

The average angular velocity of a runaway (verge) escapement

was obtained from an approximate closed form solution, a computer simulation, and from experimental data. The closed form solution developed an equation for the average angular velocity of the escape wheel as a function of applied torque, number of escape wheel teeth, average ratio of the escapement lever arms, and the mass moments of inertia of the escape wheel and verge. The computer simulation used the DRAM (Dynamic Response of Articulated Machinery) program to numerically integrate the escapement motion. In the experiment, the beat rate of an escapement was recorded and converted to the average angular velocity of the escape wheel. The closed form and computer simulation solutions gave results within 10% of the experimental results in the actual operating range of the escapement mechanism. DOE

N85-14144# Hanford Engineering Development Lab., Richland, Wash.
APPLICATION OF ROBOTICS IN REMOTE FUEL FABRICATION OPERATIONS
D. H. Nyman and T. T. Nagamoto 30 Apr. 1984 6 p refs Presented at the Robotics and Remote Handling in the Nucl. Ind. Conf., Toronto, 23-27 Sep. 1984; sponsored by the Candian Nuclear Society
(Contract DE-AC06-76FF-02170)
(DE84-011481; HEDL-SA-3059-FP; CONF-840916-1) Avail: NTIS HC A02/MF A01

The secure automated fabrication (SAF) line, an automated and remotely controlled manufacturing process, will produce mixed uranium/plutonium oxide fuel pins for the fast flux test facility (FFTF). The application of robotics in the fuel fabrication and supporting operations is described. DOE

N85-14145# National Coal Board, Grimethorpe (England).
BACK END VALVES: HISTORY AND MODIFICATIONS Status Report, Jun. 1983
Feb. 1984 42 p Sponsored in part by Dept. of Energy, England and Kernforschungsanlage Juelich GmbH, West Germany
(DE84-009272; DOE/ET-10393/1593) Avail: NTIS HC A03/MF A01

The valves which control the combustor freeboard pressure and are known as the back end valves are discussed. They are situated downstream of the main heat exchanger. They require to work under adverse conditions. The valves and a history of their operation and modifications from December 1980 to April 1983 is described. Considerable erosion and control problems were experienced, however, operational and mechanical modifications are made which greatly improve the reliability of the valves. DOE

N85-14146# National Centre of Tribology, Risley (England). European Space Tribology Lab.
THE EUROPEAN SPACE TRIBOLOGY LABORATORY (ESTL) ACTIVITIES REPORT Progress Report, 1982
A. J. Walton Paris ESA Mar. 1984 14 p refs
(ESA(ESTL)61; ESA-CR(P)-1907) Avail: NTIS HC A02/MF A01

Tribological tests on solar array mechanisms and the faint object camera mechanism of the Space Telescope were performed. Slip ring/brush performance was studied. Tests on fluorinated oil; gear materials and lubricants for use in vacuum; MoS2 as a bearing lubricant; stiffness, torque and thermal conductance of fourpoint contact bearings; an antenna pointing mechanism test facility; and verification of computer simulations of bearing systems are discussed. Author (ESA)

N85-14147# Fraunhofer Inst., Freiburg (West Germany).
DEVELOPMENT OF A CAPACITIVE SENSOR SYSTEM FOR HIGH TEMPERATURE APPLICATION Final Report, Jan. 1982
Alfred Dumbs and Eckhard Bergmann Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 73 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-84-027; ISSN-0171-7618) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

A capacitive sensor system for distance measuring in a tempering furnace with a temperature of 900 C was developed. The position tolerances of workpieces to be handled by a robot require program controlled handling adapted to the situation. This adaptation is achieved by one dimensional distance measurement with a field-sensor. The sensor system and the changes at the work place in front of the furnace are described. During 1 yr testing as an integrated subsystem of a production line, the sensors proved to be suited for industrial applications. Author (ESA)

N85-14148# Thyssen Draht A.G., Hamm (West Germany). Schweisstechnik.
OPTIMIZATION OF TOUGHNESS PROPERTIES OF HSCA SHIELDED METAL ARC WELDING ELECTRODES Final Report, Dec. 1983
Juergen Piehl Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 25 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-186; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,50

Shielded metal arc welding electrodes of the Mn-Ni low alloyed type with Ni contents of 1.0%, 1.4%, and 2.0% and an electrode of the Mn Ni Mo alloy type for pressure vessel plates, for use with steels with minimum yield strength values in the range 420 to 500 MPa were developed. The core wire analytical tolerances were narrowed by selection of raw materials for the coating composition. Improvements to shop floor welding procedures were elaborated to give an additional safety margin for constructions and weld tests. Author (ESA)

N85-14149# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Unternehmensbereich Neue Technologie.
STIRLING ENGINE DEVELOPMENT, STATE OF THE ART, POSSIBLE ENGINE APPLICATIONS AND SUITABILITY IN COMPARISON TO ESTABLISHED PLANTS AND SYSTEMS Final Report, Oct. 1983
Franz Beschorner, Joachim Grossmann, Guenter Reuchlein, Hanno Schaaf, Heinz Pfeiffer, Bernhard Gondro, and Johann Mueller Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 214 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-196; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

The Stirling engine cycle feasible limits, development potential, usable gases, heat sources, fuels, and pollutant emission are discussed. Running gear versions of free-piston engines and power generation engines are explained; power and efficiency progress is considered. The application of Stirling engines for solar energy utilization, heat pump drive and electric power generation are assessed. Author (ESA)

N85-14021# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
HEMISPHERICAL ANTENNA POINTING MECHANISM
W. Auer and H. Schulz *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 153-157 (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

N85-14022# Societe Nationale Industrielle Aerospatiale, Cannes (France).
ARABSAT SPACECRAFT: RX AND TX ANTENNA MECHANISMS
C. Long and C. Vidal *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 159-167 (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-14150 United Kingdom Atomic Energy Authority, Risley (England).
THE DETECTION AND ASSESSMENT OF DEFECTS IN AUTOMATIC ULTRASONIC INSPECTION
G. Engl and D. Figlhuber 5 Jul. 1984 19 p refs Transl. into ENGLISH from "Bruchkonzepte und zerstoerungsfeie pruefverfahren" 198u, National Inst. for Materials Testing, Stuttgart
(BLL-Risley-Tr-4597-(9091.9)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Nondestructive testing techniques play an important part in the verification of the quality of components which are required to meet stringent safety standards. For in service inspections in particular, automatic ultrasonic inspection occupies a prominent place. KWU has now undertaken 21 automatic ultrasonic inspections of the vessels of pressurized water and boiling water reactors, and a further 10 inspections of the remaining components of the reactor coolant system of PWR's. In order to check on the defect detection capability of the inspection techniques utilized and to extend experience as regards inspection standards for the assessment of defects, measurements are performed continuously using test objects containing defects which are as natural as possible. By making national and international comparisons, this enables the performance of the technique being employed to be demonstrated and also the development prospects of any future techniques. Author

N85-14151# Pacific Northwest Lab., Richland, Wash.
IMPACT OF NDE UNRELIABILITY ON PRESSURE VESSEL FRACTURE PREDICTIONS
F. A. Simonen Jun. 1984 28 p refs Presented at the ASME Pressure Vessel and Piping Conf., San Antonio, 17-21 Jun. 1984
(Contract DE-AC06-76RL-01830)
(DE84-015586; PNL-SA-11946; CONF-840647-25) Avail: NTIS HC A03/MF A01

The significant variables of flaw depth, length, location and orientation that are required for fracture mechanics evaluations of pressure vessel integrity are reviewed. Results of calculations are presented which emphasize pressurized thermal shock (PTS) and the significance of flaws that are located at or near the inside surface of the vessel. For PTS conditions, previous studies have shown that vessel failure probability is relativity insensitive to flaw depth. The impact of flaw length is also evaluated, indicating the importance of fully characterizing all flaw dimensions by NDE. Results of other evaluations are presented, which show the importance of accurately locating flaws by NDE. The influence of vessel cladding is emphasized, with the relative significance of flaws through the clad and at various depths below the clad being addressed. DOE

N85-14152# Los Alamos Scientific Lab., N. Mex.
COLLIMATION TECHNIQUES FOR DENSE OBJECT FLASH RADIOGRAPHY
Karl H. Mueller Aug. 1984 8 p refs Presented at the 16th Intern. Congr. on High Speed Photography and Photonics, Strasbourg, 27-31 Aug. 1984
(Contract W-7405-eng-36)
(DE84-016461; LA-UR-84-2654; CONF-840887-6) Avail: NTIS HC A02/MF A01

In explosively driven experiments, flash radiography can record a wealth of information about material densities and boundaries. Obtaining accurate quantitative data from these radiographs requires careful design of the experiment so that one can control and measure the scattered radiation background that is a part of any experiment. Collimators were used at the X-ray source to match the incident X-ray flux to the transmission of the object, thereby reducing the production of scattered radiation while still preserving a complete view of the object. Multi-hole collimators (at the film plane) with a length-to-diameter ratio of approx. 20:1 were used to measure the scattered radiation field with several exposure geometries and with various shielding methods. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-14153 British Library Lending Div., Boston Spa (England).
CONDITIONS FOR ASSEMBLING DIES FOR DRAWING UNDER HYDRODYNAMIC FRICTION CONDITIONS
G. L. Kolmogorov, T. E. Melnikova, and B. N. Kiritsev 7 Nov. 1984 9 p refs Transl. into ENGLISH from Stal (USSR), v. 4, 1984 p 65-67
(BLL-M-35954-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The stresses during the assembly of built-up dies are discussed and the mathematics of their determination are given. Methods of assembly are considered in detail, and the maximum permissible pressing force is determined. Author

N85-14154 British Library Lending Div., Boston Spa (England).
DEFINING EFFECT OF HARDENING ON MEAN YIELD STRENGTH IN DEFORMATION ZONE
Ya. D. Vasilev and V. G. Shuvyakov 7 Nov. 1984 4 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 3, 1984 p 134-135
(BLL-M-35934-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Two formulas are derived for calculating the mean yield strength, the difference in their accuracy not exceeding 3 to 6%. Therefore, in engineering practice, the approximate formula can be used along with the accurate formula. B.G.

N85-14155 Polish Academy of Sciences, Warsaw. Pracownia Mechaniki.
CHARACTERISTIC IMPEDANCE OF A POROUS CENTER DURING TRANSMISSION OF QUASI-STATIC SINUSOIDAL VIBRATIONS [IMPEDANCJA CHARAKTERYSTYCZNA OSRODKA POROWATEGO PRZY PRZENOSZENIU QUASI-STATYOZNYCH DRGAN SINUSOIDALYNCH]
Ryszard Uklejewski 1984 23 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The concept of characteristic impedance of a porous center during transmission of quasi-static sinusoidal vibrations is discussed with reference to consolidation theory. A physical interpretation of this type of impedance is presented. Propagation of waves arising in the porous center under these conditions is discussed. A formula for the coefficient of wave reflection is given. Transl. by B.G.

N85-14156 Polish Academy of Sciences, Warsaw. Zaklad Teorii Konstrukcji.
ITERATIVE METHOD FOR DETERMINING THE DISTORTION OF ELASTIC-PLASTIC FRAMES [ITERACYJNA METODA OKRESLANIA UGIEC RAM SPREZYSTO-PLASTYCZNYCH]
Stanislaw Dorosz and Jan A. Koenig 1983 48 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

A simple iterative procedure is proposed which permits an approximate but relatively exact estimate of the effect of the propagation of plastic zones on the redistribution of the field of mechanical moments. The procedure defines moments that are lost in statically indeterminate (overly rigid) constructions. The results of calculations using the proposed procedure show that elastic-plastic distortions in two dimensional frames and beams can be determined effectively. Distortions of an I-bar (double-tee bar) are also calculated. B.G.

N85-14157 Polish Academy of Sciences, Warsaw. Zaklad Mechaniki Osrodkow Ciaglych.
COMPRESSION OF A BAND MADE OF ELASTIC, IDEALLY COULOMB PLASTIC MATERIAL [SCISKANIE PASMA Z MATERIALU SPREZYSTO-IDEALNIE PLASTYCZNEGO COULOMBA]
Czeslaw Szymanski 1984 120 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The mechanical behavior of the material of a band between rigid plates is described under conditions of forced parallel displacement of a vertical compressing plates situated above these plates. It is assumed that the material of the band is homogeneous and isotropic and that its mechanical behavior during the compression process is defined using a model of elastic, idealy Coulomb plastic material. The successive phases of the compression process are defined and analyzed with regard to various deformation zone systems, including the elastic and elastic-plastic zone in a uniaxial deformation (strain) state and the same zones in two-dimensional deformation states. Transl. by B.G.

N85-14158 Stanford Univ., Calif.
NUMERICAL IMPROVEMENT OF ASYMPTOTIC SOLUTIONS AND NONLINEAR SHELL ANALYSIS Ph.D. Thesis
Toby Kim Parnell 1984 182 p
Avail: Univ. Microfilms Order No. DA8420601

The solutions to the equations which characterize thin shell behavior change greatly in very small distances, creating difficulties for numerical analysis techniques requiring a priori mesh specification. The ratio of the characteristic radius to the thickness is a large parameter for thin shells, and suggests the benefit of asymptotic analysis techniques. A hybrid state vector form of the governing differential equations is used and the spatial discretization performed by an integrating matrix. In linear problems, the leading term of the formal asymptotic solution provides a first approximation to the solution. Each of the independent solutions can be treated separately, and the total solution is obtained as a linear combination. The asymptotic solution may be used to estimate decay distances and thus to automate the selection of the mesh spacing. This strategy makes efficient algorithms for thin shells possible because the primary computational effort is directed only at restricted regions. The method is successful when applied to very short or very long shell segments and certain snap through buckling problems. However, a new formulation of the integrating matrix method in conjunction with the modified Newton-Raphson iterative procedure is more efficient in many cases and gives more reliable convergence. An adaptive step size algorithm further improves the efficiency. Solutions for a sample problems which involve the linear and nonlinear procedures are included. Dissert. Abstr.

N85-14159 Stanford Univ., Calif.
CHARACTERIZATION OF STRESSED METALS USING ACOUSTIC SHEAR WAVES Ph.D. Thesis
Charles Wilson Jackson 1984 84 p
Avail: Univ. Microfilms Order No. DA8420559

The design and use of a dry contacting ultrasound shear wave tranducer to characterize the texture and stress inside planar samples of polycrystalline aluminum is described. This transducer has a longer life than previous designs, while not requiring a viscous couplant whose varying properties across a scanned area confound such measurements. A pulse echo lock in system is used to measure small changes in acoustic properties as a function of position and applied and residual stresses. Examination of lock frequencies at many input shear wave orientations shows that when these samples are placed under tension, the acoustic anisotropy changes in magnitude; when the rolling is not aligned with the tension, there is also a change in the orientation of the acoustic axes. A statistical treatment predicts the variance of these point to point fluctuations in inversely proportional to the grain size of the material, which is observed. The transducer was used to characterize the residual stresses within a sample prepared by inserting an oversize cylindrical plug inside a disc. Dissert. Abstr.

N85-14160 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE CREEP AND CREEP RUPTURE OF SMC-R50 UNDER DIFFERENT THERMOMECHANICAL CONDITIONS Ph.D. Thesis
Shing-Chung Yen 1984 152 p
Avail: Univ. Microfilms Order No. DA8417842

A random fiber composite was studied at elevated temperature and constant humidity to determine the short time creep response for four constant stress levels at each of four selected temperature levels. It was found that repeatable results can be obtained by applying a mechanical conditioning prior to each creep and creep recovery test. Short time creep data were modeled using the Findley equation. Based on the short time creep results, the Findley equation was used to predict the long time creep response and the creep response due to multiple step loadings. A free energy based failure criterion was coupled with the Findley equation to predict the creep rupture time of SMC-R50. It was found that the critical free energy at the time of failure is temperature dependent. For a constant temperature, the critical free energy required for rupture is essentially a constant. It is also concluded that for limited data, the Reiner-Weisenberg failure criteria provides overall good prediction of the time to failure for SMC-R50. Dissert. Abstr.

N85-14161 Ruhr Univ., Bochum (West Germany). Inst. fuer Mechanik.
VARIATIONAL PRINCIPLES IN THERMOPLASTICITY. PART 2: COUPLED THERMOMECHANICAL PROCESSES [VARIATIONSPRINZIPE DER THERMOPLASTIZITAET. 2: GEKOPPELTE THERMOMECHANISCHE PROZESSE]
Petrisor Mazilu Aug. 1983 158 p refs In GERMAN; ENGLISH summary
(RUB-IFM-Mitt-37-Pt-2) Copyright. Avail: Issuing Activity

The variational principles for Lehmann's models of thermoplastic flow are formulated. Existing models of plastic flow are analyzed. A form of the chaloric equation more suitable for the thermoplastic processes than the usual chaloric equation of thermoelasticity is suggested. By using the concept of energy developed by Baehr, the representation of Lehmann's model is developed in a mathematical form which generalizes, in respect to nonisothermal processes, Green's model. This form also contains the model based on the normality rule suggested by Prager. For the obtained general mathematical model of thermoplasticity a variational theory based on a multicriteria procedure was developed. Author (ESA)

N85-14162 Ruhr Univ., Bochum (West Germany). Inst. fuer Mechanik.
FINITE ELEMENT METHOD CALCULATION OF A NECKING TENSION SPECIMEN INCLUDING HEAT TRANSFER INFLUENCE Thesis [ZUR BERECHNUNG DER EINSCHNUERUNG VON ZUGSTAEBEN UNTER BERUECKSICHTIGUNG THERMISCHER EINFLUESSE MIT HILFE DER FINITE-ELEMENT-METHODE]
Ulrich Blix Dec. 1983 135 p refs In GERMAN; ENGLISH summary
(RUB-IFM-Mitt-40) Copyright. Avail: Issuing Activity

Thermoplastic deformations were calculated for the necking problem of tension specimens. The procedure is adaptable to other deformation processes. The mathematical solution leads to a system of partial differential equations of the temperature and of the deformation rate. The separated mechanical and thermodynamical systems are transformed by finite element method into a system of linear equations which are solved independently. The connection is given by internal parameters, transmitted in each step. The theoretical results are compared to those obtained experimentally on specimen Al 99, and the calculation shows better accuracy than the normal mechanical method. Author (ESA)

N85-14163# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
THE FOURTH LBF COLLOQUIUM
O. Buxbaum, ed. Mar. 1984 321 p refs In GERMAN; ENGLISH

summary Colloq. held in Darmstadt, West Germany, 31 Jan. - 1 Feb. 1984
(ISSN-0721-5320) Avail: NTIS HC A14/MF A01

Theoretical methods for fatigue life prediction, and fatigue life estimation in the high cycle range are treated. Low cycle fatigue under multiaxial deformations, and influence of load sequence on crack initiation and crack propagation life are discussed. Possibilities of increasing the quality of equipment for simulation under multiple-input loading; theoretical analysis of the dynamic behavior of an automobile; and synthesis of load-time histories resulting from statistical analysis are presented. The development of failures in fatigue-loaded carbon fiber reinforced plastic laminates, and the fatigue behavior of bolted carbon fiber plastic joints and of sintered steels are considered. Fatigue life improvement due to mechanically induced compressive residual stresses; techniques to delay crack propagation; influence of residual stresses resulting from manufacturing on the fatigue strength of welded joints; and the applicability of fatigue data obtained from small castings on large, cast components are treated. For individual titles, see N85-14164 through N85-14178.

N85-14164# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
WELCOME AND INTRODUCTION [BEGRUESSUNG UND EINFUEHRUNG]
O. Buxbaum *In its* The 4th LBF Colloq. Mar. 1984 p 5-17 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Optimization of components with respect to strength, weight, and costs; and development or improvement of theoretical and experimental test methods are introduced. Theoretical fatigue life prediction is discussed. Author (ESA)

N85-14165# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
CRITICAL EVALUATION OF METHODS TO CALCULATE FATIGUE LIFE [KRITISCHE BEWERTUNG VON RECHNERISCHEN VERFAHREN ZUR LEBENSDAUERVORHERSAGE]
D. Schuetz and H. Oppermann *In its* The 4th LBF Colloq. Mar. 1984 p 19-56 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Calculation methods to improve the linear cumulative damage fatigue life prediction method of Palmgren and Miner are discussed. Procedure, physical background and accuracy of methods based on nominal stress, and notch methods are outlined. In notch tests only a few measurements are required, but they can only be applied to cases for which notched-ground loading can be calculated, and multiple effects cannot be satisfactorily taken into account. A large number of specific effects on components can be considered, but many specific measurements are required. Predictions based on fatigue behavior characteristics are to be prefered to methods using only single-step measurement data. These characteristics can best be determined using standardized load-time functions and components. Author (ESA)

N85-14166# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
POSSIBILITIES OF FATIGUE LIFE ESTIMATION IN THE HIGHER CYCLE RANGE [MOEGLICHKEITEN DER LEBENSDAUERABSCHAETZUNG IM BEREICH HOHER LASTSPIELZAHLEN]
H. Oppermann and W. Lipp *In its* The 4th LBF Colloq. Mar. 1984 p 57-78 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Experimental and theoretical fatigue life estimations are discussed. The most reliable method, experimental fatigue life estimation by operational load follow-up tests, is not economical. Since calculation methods are not reliable, the fatigue life has to be estimated with experimental methods which are substantially shortened with respect to the operation. Prediction methods are not satisfactory for components with high load cycles. Standardized and typical load-time evolutions have to be developed and test rods have to be tested in multirod test stands. Author (ESA)

N85-14167# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
LOW CYCLE FATIGUE STRENGTH FOR MULTIAXIAL LOADING OF DUCTILE MATERIALS [KURZZEITSCHWINGFESTIGKEIT BEI MEHRACHSIGER BEANSPRUCHUNG VON DUKTILEN WERKSTOFFEN]
C. M. Sonsino and V. Grubisic *In its* The 4th LBF Colloq. Mar. 1984 p 79-104 refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Low cycle multiaxial fatigue behavior of ductile materials was investigated. Loading conditions in system and machine construction due to combined axial and torsional loads, and bending and torsional loads respectively were studied. Test results show that a phase shift between dilatations and shears reduces the fatigue life, due to an enhanced fatiguing, calculated from the arithmetic average of the maximum shear amplitudes in the cross sections. A calculation method for the loading combination dilatation-shear is proposed. Author (ESA)

N85-14168# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
SEQUENCE OF EFFECTS IN THE CRACK INITIATION AND CRACK PROPAGATION PHASE [REIHENFOLGEEINFLUESSE IN DER RISSENTSTEHUNGS- UND RISSFORTSCHRITTSPHASE]
H. Lowak and H. Huth *In its* The 4th LBF Colloq. Mar. 1984 p 105-122 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

The influence of a sequence of loads on fatigue life till crack initiation, on crack propagation, and on fatigue life estimation is shown. In practice, higher and lower cycles are well mixed, and sequence plays only a minor role in fatigue life. Load-time functions in operational strength tests for experimental fatigue life estimation must have the same ratio of higher and lower cycles as in reality, or else estimation errors up to a factor of 10, whereby the effect on the crack initiation phase is much larger than on the crack propagation phase, can occur. Linear damage accumulation method estimates are not suitable for load sequences. Author (ESA)

N85-14169# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
POSSIBILITIES OF INCREASING THE SIMULATION QUALITY OF MULTIAXIAL TEST STANDS [MOEGLICHKEITEN ZUR STEIGERUNG DER SIMULATIONSGUETE MEHRAXIALER VERSUCHSEINRICHTUNGEN]
P. Pantucek and V. Grubisic *In its* The 4th LBF Colloq. Mar. 1984 p 123-141 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Vehicle road test simulation is discussed. Hardware improvements to the load introduction and control system are considered. The determination of operational strength in the laboratory has decisive advantages, such as shorter development times due to permanent availability and independence of weather effects, and increased accuracy in the reproduction of loading conditions with better observation possibilities. Author (ESA)

N85-14170# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
THEORETICAL ANALYSIS OF THE DYNAMIC BEHAVIOR OF STRUCTURES WITH A PASSENGER CAR AS EXAMPLE [RECHNERISCHE BEANSPRUCHUNGSANALYSE SCHWINGUNGSFAEHIGER KONSTRUKTIONEN AM BEISPIEL EINES PKW]
H.-P. Lehrke *In its* The 4th LBF Colloq. Mar. 1984 p 143-154 In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

The preparation and testing of calculation models for cars is

treated, and the external loads during driving are described. Results show that the calculation models are satisfactory for dynamic loading. From these models car-independent loading characteristics are deduced with which the loading of other cars can be calculated, assuming that they follow previously identified roads. Statistical analysis of the time functions of these loading characteristics allows arbitrary road and utilization combinations with given statistical characteristics to be generated. This enables the loading necessary for the optimal design of components and for the experimental testing of their strength, independently of the production of a first prototype, to be calculated. Author (ESA)

N85-14171# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
SYNTHESIS OF LOAD-TIME HISTORIES RESULTING FROM STATISTICAL ANALYSIS [SYNTHESE VON LAST-ZEIT-FUNKTIONEN AUS DEN ERGEBNISSEN STATISTISCHER ANALYSEN]
H. Steinhilber and H. Klaetschke *In its* The 4th LBF Colloq. Mar. 1984 p 155-171 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

A synthesis concept of load-time histories of a car front wheel suspension is presented. Simultaneous loading causes are cornering, braking, and road roughness. The concept is used in computer-controlled servohydraulic test stands. Load-time functions with operation-like load ratios and conservation of all statistical characteristics, including the correlations between the single load components, can be obtained. Strength tests with several forces can be conducted on constructions with loads which can be extrapolated to arbitrary fatigue life measurements and which can contain arbitrarily given applications. Author (ESA)

N85-14172# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
DEVELOPMENT OF DAMAGE IN FATIGUE LOADED CARBON FIBER REINFORCED PLASTICS [SCHADENSENTWICKLUNG IN SCHWINGBEANSPRUCHTEN CFK-LAMINATEN] c24
H. Huth *In its* The 4th LBF Colloq. Mar. 1984 p 173-190 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Damage propagation in fatigue loaded laminates was compared. Delaminations were observed with ultrasonic scanners. Damage is not related to the tensile strength of the damaged laminate. The propagation of internal delamination under stress cycles is determined by delamination depth. Laminate construction effects influence the propagation of delamination and the susceptibility to initiation of edge delamination. Edge stresses determined with a simple calculation model allow a qualitative comparison between laminates. An improvement of the calculation method, taking account of the interlaminar shear stresses, and further investigation of the edge effect are advocated. Author (ESA)

N85-14173# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE BEHAVIOR OF BOLTED JOINTS MADE OF CARBON FIBER REINFORCED EPOXY RESINS [FESTIGKEITSVERHALTEN VON FUEGUNGEN AUS KOHLEFASERVERSTAERKTEN EPOXIDHARZEN] c24
J. J. Gerharz *In its* The 4th LBF Colloq. Mar. 1984 p 191-222 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

The behavior of fiber reinforced joints under fatigue loading was investigated. The difference in fatigue behavior between carbon fiber reinforced joints and metal joints is based on the sensitivity to notches (static strength) and deformation behavior (fatigue strength). Fiber reinforced joints show a larger notch effect and in fatigue load are mostly damaged by widening of holes. This behavior can partially be explained by stress concentrations, the effects of which are presented in a measurement concept whereby the fiber reinforced material is considered as orthotropic. Many phenomena can only be fully explained if the real heterogeneous structure is taken into account. Author (ESA)

N85-14174# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE BEHAVIOR OF SINTERED STEELS AND MEASUREMENT CRITERIA FOR SINTERED PREFABRICATED PARTS [FESTIGKEITSVERHALTEN VON SINTERSTAEHLEN UND BEMESSUNGSKRITERIEN FUER GESINTERTE FERTIGTEILE] c26
C. M. Sonsino *In its* The 4th LBF Colloq. Mar. 1984 p 223-247 refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Fabrication, geometry, and load determined strength characteristics of sintered steels are reviewed, and the choice and measurement criteria of fatigue loaded sintered steel components are discussed. Fabrication (materials, density, sintering temperature, alloy composition, surface treatment); pores and notch effects; loading regime and average stress sensitivity; and complex loading situations (operational strength, multiaxial loading) are treated. The measurement of sintered prefabricated parts is discussed. Author (ESA)

N85-14175# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE LIFE IMPROVEMENT DUE TO MECHANICALLY INDUCED COMPRESSIVE RESIDUAL STRESSES [ZUR STEIGERUNG DER SCHWINGFESTIGKEIT DURCH MECHANISCH ERZEUGTE DRUCKEIGENSPANNUNGEN]
H. Lowak *In its* The 4th LBF Colloq. Mar. 1984 p 249-263 refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

The interactions between residual stress states and their influence on fatigue life were studied. Fatigue tests were conducted on notched sample rods with and without mechanically included residual stresses. The difference between the mechanically induced stresses and the stresses resulting from the loading in the notch increase the fatigue life. The residual stresses were measured with X-rays and strain gages, and calculated following the von Kollmann theory. These three methods show good agreement in the tangential residual stresses, but not in the stress distributions over the sample width. The stress-strain diagram in the notch was experimentally and theoretically determined, with good agreement. The increases of crack initiation and crack propagation lifetime are shown for several cases. Author (ESA)

N85-14176# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
PROCESSES TO INCREASE THE FATIGUE LIFE OF CONSTRUCTIONS WITH ALREADY INITIATED CRACKS [MASSNAHMEN ZUR LEBENSDAUERERHOEHUNG ANGERISSENER KONSTRUKTIONEN]
H.-G. Koebler and G. Fischer *In its* The 4th LBF Colloq. Mar. 1984 p 265-282 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Techniques to delay crack propagation in aircraft structures, steel structures and heavy machinery are presented. For light metal riveted joints, the mandreling degree has to be $> 3\%$ to obtain a considerable crack propagation delay. For cracks > 3 mm, no positive effect can be obtained by mandreling. For steel structures, drilling without additional treatment of the crack points is efficient for cracks of short length and unstrained utilization. A better fatigue strength is obtained when the crack-stop boreholes are mandreled with a degree $> 3\%$. The best results proceed from 1% oversized interference bolts. These processes prove to be efficient and can delay expensive repairs. The results are obtained in ideal test conditions and their repeatability for other components has to be checked. Author (ESA)

N85-14177# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
INFLUENCE OF RESIDUAL STRESSES RESULTING FROM MANUFACTURING ON THE FATIGUE STRENGTH OF WELDED JOINTS [EINFLUSS FERTIGUNGSBEDINGTER EIGENSPAN-

NUNG AUF DIE SCHWINGFESTIGKEIT VON SCHWEISSVERBINDUNGEN]
W. Ritter and R. Olivier *In its* The 4th LBF Colloq. Mar. 1984 p 283-300 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Fatigue strength behavior of components loaded in welded state and low-stress components under varying and growing loading was investigated. It is shown that the fatigue strength of components with residual stresses is largely independent of the nominal stresses and the applied average stress. Test results show that the scatter on the Woehler stress cycle diagram is influenced by residual welding stresses. For low loading stresses the Woehler line lies significantly under that of stress-free components; for higher stresses the lines coincide. Tests on specimens with residual stresses confirm that the fatigue life curve can be linearly extrapolated above 2 million power cycles.
Author (ESA)

N85-14178# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
APPLICABILITY OF FATIGUE STRENGTH DATA OBTAINED FROM SMALL SEPARATELY CAST SPECIMENS ON LARGE CAST COMPONENTS [UEBERTRAGBARKEIT DER SCHWINGFESTIGKEITSWERTE GETRENNT GEGOSSENER KLEINER PROBESTAEBE AUS STAHLGUSS AUF GROSSBAUTEILE]
H. Rueckert and H. Ostermann *In its* The 4th LBF Colloq. Mar. 1984 p 301-319 refs In GERMAN (For primary document see N85-14163 05-39)
Avail: NTIS HC A14/MF A01

Tests were conducted on small casted specimens in order to obtain fatigue strength values for large components. Higher specimen cross sections, higher thickness of the bending sample, and lower form number results in more representative results for the large components. The investigation shows that to obtain fatigue strength characteristics for large cast components, measurements have to be performed on large specimens with a shape like the component and component-specific conditions, especially when corrosion effects must be taken into account.
Author (ESA)

N85-14179*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS STUDIES OF EFG Quarterly Progress Report, 1 Jan. - 31 Mar. 1984
J. P. Kalejs 15 Jul. 1984 36 p refs
(Contracts NAS7-100; JPL-956312)
(NASA-CR-174078; NAS 1.26:174078; DOE/JPL/956312-07; DE84-015260) Avail: NTIS HC A03/MF A01 CSCL 20K

Four-point ending studis were continued to compare primary creep response of FZ and CZ silicon above 1200 C. Results suggest that silicon can be treated as a completely plastic solid in the temperature range 1200 to 1400 C in its response to thermal stress generated during sheet growth. In the stress range of 5 to 15 MPa, the strain rate dependence on stress is epsilon approx. sigma(10), and appears to be essentially temperature independent. Work is underway to compare stresses predicted for two different thermal models used for temperature field calculations. Stress analysis was performed to illustrate the dependence of sheet stresses on growth parameters such as sheet width, thickness and growth speed, and the coupling of these parameters to the details of the temperature field calculations used as input to the stress model. The construction of a simplified EFG ribbon system to be used to test the stress model and to investigate means to achieve low stress growth configurations is completed. The first results of measurement of residual stress distributions in EFG sheet using shadow-Moire interferometry were obtained at the University of Illinois.
DOE

N85-14180# Los Alamos Scientific Lab., N. Mex.
CHARACTERIZATION OF FIBER OPTIC CABLES UNDER LARGE TENSILE LOADS
J. W. Ogle and L. D. Looney 1984 10 p refs Presented at SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984
(Contract W-7405-eng-36)
(DE84-016816; LA-UR-84-2593; CONF-840872-19) Avail: NTIS HC A02/MF A01

Fisher optic cables designed for the Nevada Test Site (NTS) have to withstand an unusually harsh environment. Cables were manufactured under a 6 year old DOE specification that was slightly modified as the cable requirements were better understood. In order to better understand the cable properties, instrumentation was developed to characterize the transmission properties of 1 km of fiber cable placed under a controlled tensile load up to 1500 lbs. The properties measured are cable tension, cable elongation, induced attenuation, attenuation vs. location, fiber strain, bandwidth, and ambient temperature. Preforming these measurements on cables from the two qualifies NTS fiber optic cable manufacturers, Siecor and Andrew Corp., led to a net set of specifications. The relevant new and old specifications are reported along with the characterization techniques and results on cables manufactured under the old specification.
DOE

N85-14181# European Space Agency, Paris (France).
EVALUATION OF THE CRACK INITIATION LIFE BEHAVIOR OF FATIGUE LOADED AUTOMOTIVE COMPONENTS MADE FROM HIGH STRENGTH ALUMINIUM ALLOYS
Dieter Hanschmann Aug. 1984 194 p refs Transl. into ENGLISH "Ein Beitr. zur rechnergestuetzten Anrisslebensdauervorhersage schwingbeanspruchter Kraftfahrzeugbauteile aus Aluminiumwerkstoffen', DFVLR, Cologne Rept. DFVLR-FB-81-10, 1981
(ESA-TT-733; DFVLR-FB-81-10) Avail: NTIS HC A09/MF A01; original German version available from DFVLR, Cologne DM 51,50

An analytical method for predicting the crack initiation life of motor vehicle components subjected to irregular vibration stresses was developed. The deformation processes in the stress concentration regions were determined explicitly and were used as a basis for damage computation. A damage parameter concept was provided to account for the nonlinearity of cumulative damage. This concept also considers the effects of loading sequence on material damage in addition to the influence of mean stresses. The validity of the method was checked with car chassis components.
Author (ESA)

N85-14182# Texas Univ., Austin. Center for Transportation Research.
EXPLORATORY STUDY OF SHEAR STRENGTH OF JOINTS FOR PRECAST SEGMENTAL BRIDGES Interim Research Report
K. Koseki and J. E. Breen Sep. 1983 108 p refs Sponsored in part by Texas State Dept. of Highways and Public Transportation (PB84-235449; CTR-3-5-80-248-1; FHWA/TX-84/32-248-1) Avail: NTIS HC A06/MF A01 CSCL 13B

The joints between the precast segments are of critical importance in segmental bridge construction. They are critical to the development of structural capacity by ensuring the transfer of shear across the joints and often play a key role in ensuring durability by protecting the tendon against corrosion. However, construction of the joints must be simple and economical. The relative shear transfer strength across different types of joints typically used between adjacent segments of precast segmental bridges was investigated. The types of joints considered included no keys, single large keys, and multiple lug keys. Both dry and epoxy joints were tested.
Author (GRA)

N85-14016# Saab-Scania, Linkoping (Sweden).
STRUCTURAL DESIGN AND THERMAL STABILITY OF TELE-X ANTENNA TOWER
B. Moertberg *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 117-120 (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

N85-14019# Rome Univ. (Italy). Dipt. Aerospaziale.
ELASTIC DISPERSION EFFECTS ON DYNAMICS AND CON-

TROL OF LARGE MODULAR ANTENNAS
F. Graziani, S. Sgubini, and A. Agneni *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 141-146 refs (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

N85-14662# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION AND ANALYSIS OF OSCILLATIONS OF THIN-WALLED SPHERICAL SHELL DURING PULSE LOADING Abstract Only
V. A. Maltsev, Yu. A. Konon, V. V. Adishchev, and V. M. Kornev *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 75-76 Transl. into ENGLISH from Fizika Goreniya Vzryva (Novosibirsk, USSR), v. 20, no. 2, Mar. - Apr. 1984 p 97-102 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

42 GEOSCIENCES (GENERAL)

N85-14183*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE INTERACTION OF GLOBAL BIOCHEMICAL CYCLES
B. Moore, III (New Hampshire Univ.) and M. N. Dastoor 15 Jan. 1984 257 p refs Workshop held in Rosslyn, Va., 10-13 Apr. 1983
(NASA-CR-174184; JPL-Pub-84-21; NAS 1.26:174184) Avail: NTIS HC A12/MF A01 CSCL 04A

The global biosphere in an exceedingly complex system. To gain an understanding of its structure and dynamic features, it is necessary not only to increase the knowledge about the detailed processes but also to develop models of how global interactions take place. Attempts to analyze the detailed physical, chemical and biological processes in this context need to be guided by an advancement of understanding of the latter. It is necessary to develop a strategy of data gathering that severs both these purposes simultaneously. The following papers deal with critical aspects in the global cycles of carbon, nitrogen, phosphorus and sulfur in details as well as the cycle of water and the flow of energy in the Earth's environment. The objective is to set partly the foundation for the development of mathematical models that allow exploration of the coupled dynamics of the global cycles of carbon, nitrogen, phosphorus, sulfur, as well as energy and water flux. For individual titles, see N85-14184 through N85-14195.

N85-14184*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BIOGEOCHEMICAL CYCLES: INTERACTIONS IN GLOBAL METABOLISM c46
B. Moore (New Hampshire Univ., Durham), H. Morowitz (Yale Univ., New Haven, Conn.), and M. N. Dastoor *In its* The interaction of Global Biochemical Cycles 15 Jan. 1984 p 17-24 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

A science that chooses the globe as it fundamental biogeophysical unit forces extraordinary conceptual difficulties. The roles of energy flow, matter cycles, carbon cycle, air pollution, global effects, air water interactions are discussed. B.G.

N85-14185*# Stockholm Univ. (Sweden).
GLOBAL BIOGEOCHEMICAL CYCLES: STUDIES OF INTERACTION AND CHANGE, SOME VIEWS ON THE STRATEGY OF APPROACH c47
B. Bolin *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 25-54 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04B

The global biosphere is an exceedingly complex system. To gain an understanding of its structure and dynamic features, it is necessary to increase knowledge about the detailed processes, but also to develop models of how global interactions take place. Attempts to analyze the detailed physical, chemical and biological processes need, in this context, to be guided by an advancement of understanding of the latter. It is necessary to develop a strategy of data gathering that serves both these purposes simultaneously. climate research during the last decade may serve as a useful example of how to approach this difficult problem in a systematic way. Large programs for data collection may easily become rigid and costly. While realizing the necessity of a systematic and long lasting effort of observing the atmosphere, the oceans, land and life on Earth, such a program must remain flexible enough to permit the modifications and even sometimes improvisations that are necessary to maintain a viable program. Author

N85-14186*# Oak Ridge National Lab., Tenn.
SOME ASPECTS OF UNDERSTANDING CHANGES IN THE GLOBAL CARBON CYCLE c47
W. R. Emanuel, B. Moore (New Hampshire Univ., Durham), and H. H. Shugart *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 55-84 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04B

The collective character of carbon exchanges between the atmosphere and other pools is partially revealed by comparing the record of CO2 concentration beginning in 1958 with estimates of the releases from fossil fuels during this period. In analyzing the secular increase in CO2 concentration induced by fossil fuel use, the atmosphere is generally treated as a single well-mixed reservoir; however, to study finer structure in the CO2 records, the influence of atmospheric circulation must be more carefully considered. The rate of carbon uptake by the oceans, the primary sink for fossil fuel CO2, is assessed more reliably than influences on the atmosphere due to interactions with other pools. Models of the global carbon cycle are being substantially refined while data that reflect the response of the cycle to fossil fuel use and other perturbations are being extended. B.G.

N85-14187*# Duke Univ., Durham, N. C.
CARBON CYCLE: TERRESTRIAL INTERACTIONS c45
W. H. Schlesinger *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 85-96 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01

The effect of living biota, soil organic matter, soil carbonates, natural or steady state exchange, rivers, fossil fuels, and plant respiration on the carbon cycle are discussed. B.G.

N85-14188*# Woods Hole Oceanographic Institution, Mass.
GLOBAL CARBON - NITROGEN - PHOSPHORUS CYCLE INTERACTIONS: A KEY TO SOLVING THE ATMOSPHERIC CO2 BALANCE PROBLEM? c46
B. J. Peterson and J. M. Mellillo *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 97-116 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

If all biotic sinks of atmospheric CO2 reported were added a value of about 0.4 Gt C/yr would be found. For each category, a very high (non-conservative) estimate was used. This still does not provide a sufficient basis for achieving a balance between the sources and sinks of atmospheric CO2. The bulk of the discrepancy lies in a combination of errors in the major terms, the greatest being in a combination of errors in the major terms, the greatest being in the net biotic release and ocean uptake segments, but smaller errors or biases may exist in calculations of the rate of atmospheric CO2 increase and total fossil fuel use as well. The reason why biotic sinks are not capable of balancing the CO2 increase via nutrient-matching in the short-term is apparent from a comparison of the stoichiometry of the sources and sinks. The burning of fossil fuels and forest biomass releases much more CO2-carbon than is sequestered as organic carbon. B.G.

N85-14189*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THREE DIMENSIONAL GLOBAL MODELING OF ATMOSPHERIC CO2 c46

J. Hanse, I. Fung, and D. Rind *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 117-140 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

The initial attempts to model the atmospheric CO2 distribution, including couplings to the ocean and biosphere as sources and sinks of atmospheric CO2, encourage the notion that this approach will lead to useful quantitative constraints on CO2 fluxes. Realization of this objective will require: (1) continued improvement in the realism of the global transport modeling; (2) extended timeline of atmospheric CO2 monitoring, which improved precision and improved definition of the uncertainties in the measured CO2 amounts; and (3) given an accurate knowledge of model capabilities and limitations and given a good understanding of CO2 observations and their limitations, there is a need for good ideas concerning what quantitative information on the carbon cycle can be inferred from global modeling. Author

N85-14190*# Florida State Univ., Tallahassee. Dept. of Oceanography
INTERACTIONS OF THE MARINE PHOSPHORUS AND CARBON CYCLES c48
P. N. Froelich *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 141-178 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 08C

About 30 to 50% of the fluvial P-input to the oceans derives from release of reactive-P from particles during their passage through estuaries. The input is matched by P-removal into three approximately equivalent sink: (1) burial in phosphorites on productive shelves; (2) burial with (org) in the deep-sea; and (3) burial with biogenic calcite in the deep-sea. The P/C burial ratio in these three phases is very different: P/C (org) approximately .004; P/C (CaCO3) approximately .001; and P/C (PHOS) approximately .03. The removal mechanisms are all coupled to primary production in the surface ocean, but the details of the feedback mechanisms controlling the steady-state nutrient and carbon budgets in the sea are doscured by lack of knowledge of how the P/C ratios in the sinks adjust, and how shifts in oceanic nutrients affect oceanic ecology and the relative fraction of biogenic CaCO3 and (org) production. B.G.

N85-14191*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NITROGEN CYCLE: ATMOSPHERE INTERACTIONS c46
J. S. Levine *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 179-208 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

Atmospheric interactions involving the nitrogen species are varied and complex. These interactions include photochemical reactions, initiated by the absorption of solar photons and chemical kinetic reactions, which involve both homogeneous (gas-to-gas reactions) and heterogeneous (gas-to-particle) reactions. Another important atmospheric interaction is the production of nitrogen oxides by atmospheric lightning. The nitrogen cycle strongly couples the biosphere and atmosphere. Many nitrogen species are produced by biogenic processes. Once in the atmosphere nitrogen oxides are photochemically and chemically transformed to nitrates, which are returned to the biosphere via precipitation, dry deposition and aerosols to close the biosphere-atmosphere nitrogen cycle. The sources, sinks and photochemistry/chemistry of the nitrogen species; atmospheric nitrogen species; souces and sinks of nitrous oxide; sources; sinks and photochemistry/chemistry of ammonia; seasonal variation of the vertical distribution of ammonia in the troposphere; surface and atmospheric sources of the nitrogen species, and seasonal variation of ground level ammonia are summarized. B.G.

N85-14192*# Stanford Univ., Calif. Dept. of Biological Sciences.
TERRESTRIAL NITROGEN CYCLES: SOME UNANSWERED QUESTIONS c45
P. Vitousek *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 209-218 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 13B

Nitrogen is generally considered to be the element which most often limits the growth of plants in both natural and agricultural ecosystems. It regulates plant growth because photosynthetic rates are strongly dependent on the concentration of nitrogen in leaves, and because relatively large mounts of protein are required for cell division and growth. Yet nitrogen is abundant in the biosphere - the well-mixed pool in the atmosphere is considered inexhaustible compared to biotic demand, and the amount of already fixed organic nitrogen in soils far exceeds annual plant uptake in terrestrial ecosystems. In regions where natural vegetation is not nitrogen limited, continuous cultivation induces nitrogen deficiency. Nitrogen loss from cultivated lands is more rapid than that of other elements, and nitrogen fertilization is generally required to maintain crop yield under any continuous system. The pervasiveness of nitrogen deficiency in many natural and most managed sites is discussed. B.G.

N85-14193*# Scripps Institution of Oceanography, San Diego, Calif.
RECENT STUDIES OF THE OCEAN NITROGEN CYCLE c48
R. W. Eppley *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 219-228 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 08C

The nitrogen cycle in the ocean is dominated by the activities of organisms. External nitrogen inputs from land and from the atmosphere are small compared with rates of consumption and production by organisms and with rates of internal rearrangements of nitrogen pools within the ocean. The chief reservoirs of nitrogen are, in decreasing order of size: nitrogen in sediments, dissolved N2, nitrate, dissolved organic nitrogen (DON), particulate organic nitrogen (PON) (mostly organisms and their by-products). The biogenic fluxes of nitrogen were reviewed. The rate of PON decomposition in the surface layer must be comparable to the rate of ammonium consumption; and at the same time the nitrate consumption rate will be similar to the rates of: (1) sinking of PON out of the surface layer and its decompositon at depth, (2) the rate of nitrification at depth, and (3) the rate of nitrate return to the surface layer by upwelling. B.G.

N85-14194*# Oak Ridge National Lab., Tenn.
MODELING LONG-TERM CHANGES IN FORESTED LANDSCAPES AND THEIR RELATION TO THE EARTH'S ENERGY BALANCE c45
H. H. Shugart, W. R. Emanuel, and A. M. Solomon *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 229-252 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 02F

The dynamics of the forested parts of the Earth's surface on time scales from decades to centuries are discussed. A set of computer models developed at Oak Ridge National Laboratory and elsewhere are applied as tools. These models simulate a landscape by duplicating the dynamics of growth, death and birth of each tree living on a 0.10 ha element of the landscape. This spatial unit is generally referred to as a gap in the case of the forest models. The models were tested against and applied to a diverse array of forests and appear to provide a reasonable representation for investigating forest-cover dynamics. Because of the climate linkage, one important test is the reconstruction of paleo-landscapes. Detailed reconstructions of changes in vegetation in response to changes in climate are crucial to understanding the association of the Earth's vegetation and climate and the response of the vegetation to climate change. B.G.

N85-14195*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AIR-SEA HEAT EXCHANGE, AN ELEMENT OF THE WATER CYCLE c46
M. T. Chahine *In its* The interaction of Global Biochemical Cycles

15 Jan. 1984 p 253-255 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

The distribution and variation of water vapor, clouds and precipitation are examined. Principal driving forces for these distributions are energy exchange and evaporation at the air-sea interface, which are also important elements of air-sea interaction studies. The overall aim of air-sea interaction studies is to quantitatively determine mass, momentum and energy fluxes, with the goal of understanding the mechanisms controlling them. The results of general circulation simulations indicate that the atmosphere in mid-latitudes responds to changes in the oceanic surface conditions in the tropics. This correlation reflects the strong interaction between tropical and mid-latitude conditions caused by the transport of heat and momentum from the tropics. Studies of air-sea exchanges involve a large number of physica, chemical and dynamical processes including heat flux, radiation, sea-surface temperature, precipitation, winds and ocean currents. The fluxes of latent heat are studied and the potential use of satellite data in determining them evaluated. Alternative ways of inferring heat fluxes will be considered. B.G.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-14196 Rijkswaterstaat, The Hague (Netherlands).
CONTRIBUTIONS TO REMOTE SENSING : APPLICATIONS OF THERMAL INFRARED
H. W. BrunsveldvanHulten, ed., P. Hoogeboom, A. F. G. Jacobs, C. Kraan, G. P. Deloor, and L. Wartena 1984 119 p refs
(Commun-34/1984; B8470308) Avail: Issuing Activity

Thermal mapping applications in hydrology and oceanography are reviewed. Ground water flow near the surface and the seepage of water from a water body into the adjacent land can be detected qualitatively. The optimal moments for maximal surface temperature contrasts can be established, using a heat balance model for soil which is presented. Water intrusion into land can be studied. In oceanography, the large scale surface temperature distribution was detected. The kinematics of water bodies in relation to cooling water can be studied in detail. Horizontal temperature distribution information enables the heat load to be approximated, and provides guidance to optimize surface measurements. Thermal mapping is useful for studying mixing of two water bodies from different origins, but cannot cope with a combination of oil spills and cooling water. Author (ESA)

N85-14197*# SAR, Inc., Riverdale, Md.
LANDSAT INSTRUMENTS CHARACTERIZATION
Y. Lee, Principal Investigator Sep. 1984 6 p ERTS
(Contract NAS5-28200)
(E85-10028; NASA-CR-174119; NAS 1.26:174119) Avail: NTIS HC A02/MF A01 CSCL 05B

Twelve subscenes were selected from LANDSAT 5, scene 50129-17075 over White Sands, NM. Data set WHITE covers the entire White Sands desert area. Black and white films and hard copy prints of each band in this area were produced. A new command file was written for the interactive digital image manipulation system (IDIMS) to generate pseudocolor pixel prints of LANDSAT Thematic Mapper bands for data from B and A tapes. The program PCMAIN.FOR of principal component analysis and a supplemental program HEDIT.FOR for generating sampled data sets were developed. The procedures for performing component analysis on a subscene by using these programs are described. Modifications to various subroutines are listed. Bright target saturation internal calibration lamp state dependence was examined using calibration data of night scene 50052-02182, WRS 111/112 over Harrisburg, PA. R.S.F.

N85-14198*# SAR, Inc., Riverdale, Md.
LANDSAT INSTRUMENTS CHARACTERIZATION
Y. Lee, Principal Investigator Jul. 1984 16 p ERTS
(Contract NAS5-28200)
(E85-10029; NASA-CR-174120; NAS 1.26:174120) Avail: NTIS HC A02/MF A01 CSCL 08B

The present CALDUMP tape consists of five calibration files and one reduced calibration file. The calibration files, each with data of 200 pixels, cover an entire calibration region starting from the 6251 minor frame (mf). Program LEE.FOR was developed to edit these five files into seven .CAL files in the TAE mode. Program PCAL.FOR reads the .CAL files and plots the 1000 pixels of any scan line in linear or log scale. The typical spectra of the calibration region of forward and reverse scans are shown. The positions of the start and the end of shutter obscuration and the calibration pulse are shifted increasingly or decreasingly from Channel 1 to Channel 16, due to the timing of data acquisition. To produce TRAPP usable input files are, the following procedures need to be taken: (1) determine the start of shutter obscuration position; (2) determine the calibration pulse and background region relative to the start of shutter obscuration; and (3) determine the end of shutter obscuration position. M.G.

N85-14199*# SAR, Inc., Riverdale, Md.
LANDSAT INSTRUMENTS CHARACTERIZATION
Y. Lee, Principal Investigator Jun. 1984 3 p ERTS
(Contract NAS5-28200)
(E85-10030; NASA-CR-174121; NAS 1.26:174121) Avail: NTIS HC A02/MF A01 CSCL 08B

Work performed for the LANDSAT instrument characterization task in the areas of absolute radiometry, coherent noise analysis, and between-date smoothing is reported. Absolute radiometric calibration for LANDSAT-5 TM under ambient conditions was performed. The TM Radiometric Algorithms and Performance Program (TRAPP) was modified to create optional midscan data files and to match the TM Image Processing System (TIPS) algorithm for pulse determination. Several data reduction programs were developed, including a linear regression and its plotted result. A fast Fourier transformation study was conducted on the resequenced TM data. Subscenes of homogeneous water within scenes over Pensacola, Florida were used for testing the FFT on the resequenced data. Finally, a gain and pulse height stability study of LANDSAT 5 TM spectral bands was performed. M.G.

N85-14200*# SAR, Inc., Riverdale, Md.
CHARACTERIZING THE SCIENTIFIC POTENTIAL OF SATELLITE SENSORS
Y. Lee, Principal Investigator Oct. 1984 13 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-28200)
(E85-10031; NASA-CR-174122; NAS 1.26:174122) Avail: NTIS HC A02/MF A01 CSCL 05B

Algorithms and software were developed for the correction of coherent noise, scan correlated shift, and the bright target saturation effect in Thematic Mapper imagery. In addition, a package of LANDSAT Assessment System programs was developed to demonstrate the results from TM radiometric characterization and calibration work. M.G.

N85-14201# Committee on Commerce, Science, and Transportation (U. S. Senate).
LAND REMOTE-SENSING COMMERCIALIZATION ACT
Washington GPO 1984 35 p Rept. to accompany H. R. 5155 presented by the Comm. on Com., Sci., and Transportation, 98th Congr., 2nd Sess., 17 May 1984
(S-Rept-98-458) Avail: US Capitol, Senate Document Room

A bill is described which provides a framework for a phased, orderly commercialization of land remote sensing technologies. The commercialization ramework includes provisions for appropriate Government regulation of private land remote sensing, continued Federal research and development in remote sensing,

and continued Government archiving of land remote sensing data. A.R.H.

N85-14202# European Space Agency, Paris (France).
EARSEL/ESA SYMPOSIUM ON INTEGRATIVE APPROACHES IN REMOTE SENSING
Norman Longdon, comp. and Olga Melita, comp. Aug. 1984 382 p refs Symp. held at Guildford, England, 8-11 Apr. 1984; sponsored by UK Dept. of Trade and Industry, UK Natural Environment Research Council and UK National Remote Sensing Centre
(ESA-SP-214; ISSN-0379-6566) Avail: NTIS HC A17/MF A01

Methodologies for integrative approaches to remote sensing; applications of integrative remote sensing; land applications; ocean and atmospheric applications; the Spacelab metric camera; and economic aspects of remote sensing were discussed. For individual titles, see N85-14203 through N85-14246.

N85-14203# Imperial Coll. of Science and Technology, London (England). Center for Remote Sensing.
THE INTERACTIVE PLANETARY IMAGE PROCESSING SYSTEM (IPIPS): A MAJOR FACILITY FOR RESEARCH AND TEACHING IN REMOTE SENSING
G. Hunt, R. Barrey, M. Easterbrook, C. England, L. Grove, V. Moore, J.-P. Muller, C. Roff, D. Rumball, and D. Clark (London Univ.) *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 15-20 refs Sponsored by UK Science and Engineering Researcg Council, UK Natural Environment Research Council and ESA (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The Interactive Planetary Image Processing System (IPIPS) was developed for studies of planetary meteorology and oceanography. The role of IPIPS in teaching programs is summarized. The IPIPS consists of two I2S image processing computers (Models 70E and 75) and a PPL 121 image display system. The host computer is a VAX 11/780 with 4 megabytes of central memory. Image data handling and processing is controlled by a portable version of the VICAR suite, graphics by the CORE system. Applications include analysis of Voyager data on global circulation of the Jovian atmosphere, IUE data on the structure and composition of outer planetary atmospheres, and METEOSAT data on Earth radiation budget. Author (ESA)

N85-14204# Florence Univ. (Italy). Dipt. di Ingegneria Elettronica.
DIGITAL COMPARISON AND CORRELATION TECHNIQUES OF REMOTE SENSING IMAGES WITH DIFFERING SPATIAL RESOLUTIONS
V. Cappellini, R. Carla, C. Conese, G. P. Maracchi, and F. Miglietta *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 23-29 refs Sponsored by CNR (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

To compare high spatial resolution remote sensing images with images having lower resolution, a procedure based on the use of a suitable low pass digital filter applied to the high resolution image, and subsequent data reduction to obtain an image comparable with the lower resolution one, is presented. To pass from low space resolution images to higher resolution ones, two estimation techniques are proposed: spectral extrapolation performed on the space frequency spectrum of the low resolution image; approximated Shannon interpolation preformed on the low resolution image, followed by resampling. Examples of LANDSAT and SEASAT images are treated. Author (ESA)

N85-14205# Centre National de la Recherche Scientifique, Montpellier (France). Section Etude des Systemes Ecologiques.
INTEGRATION OF MULTIPLE THEMATIC DATA WITH LANDSAT DATA: SOME RESULTS ABOUT THE FEASIBILITY OF MEDITERRANEAN LAND COVER INVENTORIES
B. Lacaze and G. Debussche *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 31-39 refs Sponsored by CNES (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A supervised approach to land cover identification from LANDSAT digital data based on thematic information on a Mediterranean area of Southern France was undertaken. Multitemporal vegetation index values and divergences between vegetation classes defined by physiognomical formation and/or dominant species are presented. Results indicate limitations concerning broad land-cover classes spectral separabilities, but suggest the use of LANDSAT data for identifying spatial patterns and temporal trends related to vegetation cover, when anciliary data are available. Author (ESA)

N85-14206# Natural Environment Research Council, Swindon (England). Thematic Information Service.
THE INTEGRATED USE OF DIGITAL CARTOGRAPHIC DATA AND REMOTELY SENSED IMAGERY
D. R. Catlow, R. J. Parsell, and B. K. Wyatt *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 41-46 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A technique to enable digital map data to be displayed and processed in combination with remotely sensed imagery is outlined. The exploitation of the technique in studying land cover change using multitemporal LANDSAT MSS imagery and small scale digital map data, is described. The approach involves vector data transfer followed by conversion of the cartographic data into a raster format, based on the I2S system. Encoded map data can be overlaid on the remotely sensed images, or can be used as direct input to modify and supervise the computer analysis of imagery. Author (ESA)

N85-14207# Centre National de la Recherche Scientifique, Valbonne (France). Centre de Recherches Archeologiques.
METHODOLOGICAL RESEARCH IN CONNECTION WITH THE HANDLING OF LANDSAT SATELLITE DATA FOR ARCHAEOLOGY
E. Barisano *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 47-49 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The use of satellites by archaeologists is discussed. Given the limits of satellite spatial resolution, the observable phenomena cannot be the size of the real archaeological site, but the images give precise indications as to such archaeological phenomena of linear type as Roman reticulum, roads, drainage canals, and irrigation. There is also a range of indirect indications connected to natural factors. Satellite data are of value for the knowledge of a region in every aspect: physiographic, hydrological, geomorphological, ecological, quality of soils, presence of underground water, drainage structure etc., which gives the information necessary to study paleogeography in general. Author (ESA)

N85-14208# Trinity Coll., Dublin (Ireland). Remote Sensing Applied Research Group.
METHODS FOR CORRELATING GEOLOGICAL, GEOCHEMICAL AND GEOPHYSICAL DATA WITH SATELLITE IMAGERY IN CENTRAL IRELAND
M. F. Critchley, W. E. A. Philips, and D. W. Coller *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 51-53 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Methods of integrating a remote sensing data base with a geological data base were developed to help in exploration of lead-zinc ore bodies in Ireland. These are stratiform deposits hosted in Lower Carboniferous (Tournasian) limestones. The area is heavily covered by glacial overburden, which obscures the underlying geology. Despite the overburden, remote sensing can be used to map structures in the Carboniferous limestones. Geological evidence suggests that mineralization is associated with faulting, so images of lineaments are analyzed statistically to produce

contour maps of possible mineral zones. Discriminant analysis is used to devise a classification model to distinguish between mineralized and unmineralized areas. Author (ESA)

N85-14209# Food and Agriculture Organization of the United Nations, Rome (Italy).
INTERNATIONAL COOPERATION IN REMOTE SENSING APPLICATIONS
J. A. Howard *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 57-61 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The organization of satellite remote sensing within the UN system, and functions of the Food and Agriculture Organization Remote Sensing Center, which cover satellite and airborne methods and techniques are described. Bilateral and multilateral international cooperation are reviewed. Education and training, institution building, and equipment and follow-up activities to country based projects are outlined. The need to strengthen mechanisms of international cooperation, to expand training activities, to initiate pilot action studies in developing countries and to modify equipment to the conditions existing in many developing countries is stressed. Author (ESA)

N85-14210# Dundee Univ. (Scotland). Lab. of Physics.
A COMPARISON OF TIROS-N SERIES SATELLITE DATA AND LANDSAT DATA OVER SCOTLAND
L. Hayes and A. P. Cracknell *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 63-74 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Advanced Very High Resolution Radiometer (AVHRR/2) data from TIROS-N series polar orbiting meteorological satellites were compared with near-simultaneous LANDSAT Multi-Spectral Scanner (MSS) data in an investigation of the suitability of meteorological satellite data as a supplement to LANDSAT data for land-based applications of remote sensing. Data for Scotland are compared for 3 April 1981 and 5 November 1981. The data sets were transformed to the United Kingdom Ordnance Survey Grid System using quadratic relationships between image and map coordinates established by a modified Gauss-Newton least squares approximation. Vegetation indices calculated from the spectral responses in AVHRR/2 channels 1 and 2 and MSS bands 5 and 7 were compared. Indications are that the integration of TIROS-N series imagery, available daily, with LANDSAT imagery can lead to improved environmental monitoring, especially in regions for which regular cloud-free free LANDSAT imagery is a rarity. Author (ESA)

N85-14211*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MONITORING AND MAPPING GLOBAL VEGETATION COVER USING DATA FROM METEOROLOGICAL SATELLITES
J. R. G. Townshend (Reading Univ., England), C. O. Justice (Maryland Univ., College Park), B. Holben, and C. Tucker *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 75-79 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The role of coarse resolution meteorological satellite data for monitoring and mapping of vegetation for global, continental and regional scales is outlined. In the NOAA products used the effects of cloud cover are reduced by the generation of temporal composites of images of the normalized difference vegetation index. Different land cover types are shown to have characteristic spectral phenological curves. Such data have the disadvantage of effectively increasing the apparent areal extent of small areas of green vegetation. Author (ESA)

N85-14212# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
THE FINNISH APPROACH TO MICROWAVE REMOTE SENSING OF SNOW
Martti I. Hallikainen and Martti E. Tiuri *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 81-87 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Dielectric measurements and modeling of snow and soils, development of an electronic snow wetness and density sensor, and calculations of the brightness temperature of snow-covered terrain are reviewed. Algorithms to retrieve the water equivalent of snow cover from Nimbus 7 SMMR data are described. The algorithms exploit the difference in brightness temperature between 18 and 37 GHz for snow covered terrain. Author (ESA)

N85-14213# Institute for Land and Water Management Research, Wageningen (Netherlands).
THE AREAL PATTERN OF LATENT AND SENSIBLE HEAT FLUXES: THE COMBINATION OF SOIL PHYSICS AND REMOTELY SENSED DATA
M. Menenti *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 89-96 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

It is shown that the use of satellite data to study the surface energy balance becomes easier when any given pixel of the involved satellite images can be assigned to either a class with evaporation taking place below the soil surface, or to a class with surface evaporation. A definition of evaporation front, related to the physical character of vapor flow within pores having a radius comparable with the mean free path of water vapor is proposed. According to this definition the soil water content at the evaporation front can be calculated for each soil type. A relationship between surface moisture content and surface reflectance is given to calculate the threshold reflectance corresponding to the soil water content at the evaporation front. A reflectance map, calculated from satellite data, can be applied to establish whether in a given pixel evaporation takes place at the surface. Author (ESA)

N85-14214# Forestry Commission, Farnham (England).
FOREST COVER MONITORING BY REMOTE SENSING IN GREAT BRITAIN
A. I. D. Horne *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 99-107 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The use of LANDSAT imagery to supplement aerial and ground surveys of forest and woodland, hindered by weather conditions and the high skilled-labor input required, was investigated. A large island, an area of sandy heathland, and an area comprising various types of terrain (from flat coastal areas to mountain) were examined at different times of year. The LANDSAT results were compared with ground truth data from topographical maps. Results on forest cover and tree classification are encouraging, but resolution can be inadequate for detailed user requirements. Use of remote sensing data in multitemporal, multisystem and multisampling roles allows the benefits of image processing systems to be linked to digital mapping and other data bases to provide fast analysis, monitoring and output. Author (ESA)

N85-14215# Ludwig-Maximilians-Universitaet, Munich (West Germany). Lehrstuhl fuer Landschaftstechnik.
INTEGRATIVE INVESTIGATION ON FOREST DAMAGE DETECTION BASED ON AIRBORNE MULTISPECTRAL SCANNER DATA
B. Koch and G. Kritikos (DFVLR, Oberpfaffenhofen, West Germany) *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 109-113 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Forest damage classification methods based on airborne scanner data, using spectral values of healthy and damaged conifers and the quantitative and qualitative influence of outside parameters on those values were examined. The test areas, selected through IR air photos, forest inventory maps and ground observations were subdivided into three damage classes and four age classes. The spectral reflectance values of the test areas

were assessed from 300, 1000 and 4000 m altitude between 0.4 to 1.1 and 8 to 14 microns, and in the middle infrared at 1.6 and 2.2 microns. Results show a close correlation between reflection values and damage, age and understory vegetation. Author (ESA)

N85-14216# Sveriges Lantbruksuniv., Uppsala. Dept. of Plant and Forest Protection.
REMOTE SENSING OF PLANT STRESS AND DISEASES
Hans-Erik Nilsson *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 115-125 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

An arrangement for hand-held radiometry (using an Exotech-100AX radiometer and an Omnidata Polycorder datalogger) for routine studies of spectral signatures of crop plants in field plot experiments is described. It can detect previsual water stress, N-deficiency and various crop plant diseases. Detection of barley stripe disease in six-row barley and infection by Sclerotinia sclerotiorum in oil seed rape is illustrated. Good correlations between visual disease and stress assessment, plant growth and grain yield, and reflectance data (including change in spectral properties from one day to another) are demonstrated. Increased leaf and canopy temperatures due to infection by fungal diseases and water stress are detected by IR-thermography. Author (ESA)

N85-14217# Katholieke Universiteit te Leuven (Belgium). Remote Sensing Lab.
MULTISPECTRAL (X AND C BAND) CROP CLASSIFICATION WITH SYNTHETIC APERTURE RADAR (SAR-580) OPTICAL DATA
R. Gombeer *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 127-133 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Synthetic aperture radar (SAR) optical land use data were studied with a Quantimet Image Analyzer. Slope and mean density value were extracted for classification purpose from each radar band represented on film. These parameters prove to be useful for the discrimination of major crops and broader land use categories over the agricultural area studied. The classification results compares well with ground truth data collected during the SAR-aircraft overflight. Author (ESA)

N85-14218# Reading Univ. (England). Dept. of Geography.
INTEGRATION OF MULTISPECTRAL DATA OBTAINED AT DIFFERENT VIEW ANGLES FOR VEGETATION ANALYSIS
M. J. Barnsley *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 135-142 refs Sponsored by UK National Environmental Research Council (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The extent to which digital, multispectral imagery obtained at view angles markedly off-nadir can be validly combined with that obtained by nadir-viewing sensors to monitor vegetation was studied using aircraft data. The relationship between detected spectral response and sensor view angle is shown to depend on solar zenith angle, solar azimuth angle, and wavelength of detection. Minimum off-nadir view angle effects are found in scan directions oriented close to 90/270 deg relative to the azimuth of the Sun, and at small solar zenith angles. Maximum off-nadir view angle effects are found in scan directions oriented close to 0/180 deg relative to the azimuth of the Sun, and/or at large solar zenith angles. Integration of multispectral data obtained at different view angles is unlikely to be achieved using a single radiometric correction algorithm. Author (ESA)

N85-14219# Katholieke Universiteit te Leuven (Belgium). Dienst Kartografie I.A.W.
STATISTICS AND MAPPING OF LAND USES BY MEANS OF LANDSAT MSS IMAGERY
C. Steenmans *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 143-149 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Application of spatial remote sensing, especially computer aided thematic mapping from LANDSAT MSS imagery, as a complementary information layer to topographical mapping is discussed. The importance of correct class definition and well-founded terrain confrontation is explained by comparing different statistics on land use. The satellite data is used with other geographical data (digital or analog information). An accurate map of high quality is easily obtained even with ordinary reproduction techniques, using a quantitative generalization to improve readability, raster-vector conversions to decrease CPU-time and to make differing data compatible, and contouring algorithms to make map editing conform to commonly used thematic mapping procedures. Author (ESA)

N85-14220# Southampton Univ. (England). Dept. of Geography.
THE USE OF THEMATIC MAPPER DATA FOR LAND COVER SURVEY
E. J. Milton, J. R. G. Townshend (Reading Univ., England), J. Webb, and C. Pugh (Reading Univ., England) *In* ESA EARSeL/ESA Symp. on Intergrative Approaches in Remote Sensing Aug. 1984 p 151-159 refs (For primary document see N85-14202 05-43) (Contract NERC/NSS-F60/B6/03; Grant NERC/NSS-GR3/4994)
Avail: NTIS HC A17/MF A01

Actual and simulated LANDSAT Thematic Mapper data of part of the UK were analyzed. The spatial resolving powers of the sensor are close to the predicted ones which results in the rural landscape of much of the UK being depicted in a reliable manner. The most useful bands for land cover survey are bands 2 or 3 in the visible, band 5 in the middle IR, and band 4 in the near IR. For soil survey, field measurements indicate the independant value of the slope of the reflectance curve in visible wave lengths and the relative reflectance in the middle IR. Author (ESA)

N85-14221# Indian Inst. of Remote Sensing, Dehra Dun.
LANDFORM EVALUATION THROUGH INTEGRATED REMOTE SENSING METHODS. A CASE STUDY IN PARTS OF HARYANA, INDIA
S. K. Subramanian and D. P. Rao *In* ESA EARSeL/ESA Symp. on Intergrative Approaches in Remote Sensing Aug. 1984 p 161-168 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Integrative remote sensing techniques using aerial photographs, LANDSAT imagery and computer analysis of digital satellite data were employed to study a sample area of 5000 sq km. The area, forming a part of a semi-arid zone of Haryana State in north India, suffers from severe salinity of soils and ground water, presumably caused by water logging and impeded drainage. Results indicate that aerial photographs and LANDSAT imagery provide adequate information on genetic evolution of landforms, whereas digital processing of satellite data gives promising results for automatic classification of homogeneous units on a regional scale. Author (ESA)

N85-14222# Technische Univ., Munich (West Germany). Inst. fuer Geographie.
MODULAR OPTOELEKTRONISCHER MULTISPEKTRALER SCANNER (MOMS), INTERPRETATION AND EVALUATION OF THE MOMS IMAGE ARICA, WEST COAST OF SOUTH AMERICA
H. G. Gierloff-Emden *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 169-177 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Analysis of Modular Optoelectronic Multispectral Scanner (MOMS) imagery to extract cartographic, land use, oceanographic, and geological information is outlined. The MOMS imaging experiment from orbit was succesful. The MOMS System can deliver images with additional information for thematic maps (from 300 km orbit height) up to map scales $>$ 1:200,000. An evaluation for topographic maps under these conditions seems to be possible for map scales $>$ 1:300,000. The geometric conditions are very good. An additional spectral band is recommended. Author (ESA)

N85-14223# European Space Agency. European Space Operations Center, Darmstadt (West Germany).
THE METEOSAT EXPLOITATION PROJECT, OPERATIONAL USE OF A REMOTE SENSING SYSTEM
J. deWaard, M. Fea, and A. Robson *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 181-189 (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The framework in which METEOSAT operations are conducted, the capabilities provided by the satellites and the associated ground segment, and the derived meteorological products are summarized. International cooperation in a variety of scientific fields with other agencies operating remote sensing platforms is described. The project provides continuous service until 1995, via the existing METEOSAT 1 and 2 satellites and 3 further satellites to be launched in 1987, 1988 and 1990. A preoperational satellite will bridge the gap between existing and planned services. The ground segment will be upgraded to handle 333 kbits/sec (from the present 166 kbits/sec). Author (ESA)

N85-14224# Bristol Univ. (England). Dept. of Geography.
AN INTERACTIVE TECHNIQUE FOR SATELLITE-IMPROVED RAINFALL MONITORING
E. C. Barrett *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 191-199 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The Bristol/NOAA Inter Active Scheme (BIAS) rainfall monitoring technique to simultaneously exploit mapped NOAA satellite imagery, plus appropriate (variable) selections of data from World Weather Watch SYNOP coded weather reports, is described. A global regression is used to translate satellite-derived cloud indices into initial rainfall estimates. These can be adjusted to take account of weather situations and local climate patterns. The data are processed on a NOAA VIRGS interactive computer system; interpretive decisions of data and patterns displayed on the VIRGS screen are made by an expert meteorological analyst. The technique is designed to permit a single analyst to assess grid square rainfall over subcontinental areas in near real time. Results of the application of BIAS to weather situation over parts of northwestern Europe and the USSR are discussed.
Author (ESA)

N85-14225# Valencia Univ. (Spain). Dept. of Thermology.
FROST NOWCASTING IN THE AGRICULTURAL AREA OF VALENCIA (SPAIN)
V. Casselles, S. Gandia, J. Melia, and J. delaRubia *In* ESA EARSeL/ESA Symp. in Integrative Approaches in Remote Sensing Aug. 1984 p 201-206 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The feasibility of using apparent temperature measurements from satellites for short term prediction of low temperatures from radiation frosts was studied. Images of the area obtained by the satellite HCMM and in situ temperature measurements were used. The temperature in the biological layer can be evaluated with 1K accuracy. Values of minimum temperature can be predicted 6 to 8 hr ahead for nights of strong radiation and mild winds or calm to the necessary accuracy for their utilization in systems of frost protection. Author (ESA)

N85-14226# Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
STUDY OF THE IMPROVEMENT IN ANALYZING PASSIVE MICROWAVE REMOTE SENSING DATA BY INTEGRATED USE OF GROUND DATA
John Skelmose Jensen *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 207-213 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A method for using NIMBUS-7 Scanning Multichannel Microwave Radiometer (SMMR) data in a semienclosed sea was used to estimate sea surface temperatures (SST) and wind speed (WS). The retrieval functions are calibrated by sea truth data. As the weather conditions change from day to day, the retrieval functions are also reestimated from day to day. Thereby, it is possible to use the actual correlations between the physical parameters and the SMMR-data for that day. The method was tested in a 4 day experiment in the North Sea where SST and WS are estimated with an accuracy of 0.8 K and 2.7 m/sec respectively. Author (ESA)

N85-14227# Institute of Oceanographic Sciences, Birkenhead (England).
COMPONENTS OF THE TIME VARIATION OF SEA SURFACE HEIGHT FROM SEASAT ALTIMETER DATA
P. L. Woodworth *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 215-220 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Time-dependent components of satellite radar altimeter sea surface height measurements (the barotropic correction, significant wave height correction and the signal from ocean tides) are examined using data from the SEASAT 3-day repeat orbit. The extraction of tidal information from altimeter data is demonstrated by two complementary methods, and results from one of the methods for the East Pacific are presented. The results demonstrate the importance of the three time-dependent components, and illustrate the usefulness of the tidal extraction methods.
Author (ESA)

N85-14228# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
CONCEPTUAL IDEAS FOR A SECOND GENERATION METEOSAT SYSTEM
N. Hennen, B. Kunkel, M. Cutter (SIPA Ltd.), D. Hoge (ESA, Toulouse), and K. H. Stewart (ESA, Toulouse) *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 221-231 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Satellite and payload concepts for a geostationary meteorological satellite system are outlined. The oscillating three axis stabilization concept and the optical and passive microwave payload conceived against a set of preliminary mission requirements are described. Imaging radiometer, infrared atmospheric sounding radiometer, and microwave sounding radiometer designs are discussed. The satellite attitude determination and control, electrical power, propulsion, telemetry and data handling, and configuration are treated. Author (ESA)

N85-14229# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
METRIC CAMERA EXPERIMENT: SPACELAB 1 MISSION
M. Schroeder *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 235-241 (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A calibrated mapping camera to photograph the Earth was flown on the Spacelab 1 mission. It is a Zeiss RMK 305 mm aerial survey camera, modified to expose image number, time of release event, exposure time, f-stop, and a six-step gray wedge on every image frame. Image scale is 1:820,000, giving 190 x 190 km ground coverage for the 23 x 23 cm image format. For stereoscopic evaluation images were taken with at least 60% overlap in flight direction. An area of 11 million sq km was photographed, of which 70% is suitable for evaluation. Color infrared film was used for 550 photographs, black and white film for 450 photographs. Objects on the ground of 20 m can be recognized, in spite of the poor lighting conditions. Author (ESA)

N85-14230# Technische Univ., Hanover (West Germany).
THE PHOTOGRAMMETRIC CAMERA EXPERIMENT ON SPACELAB 1
Gottfried Konecny *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 243-250 refs (For

primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A Zeiss RMK 30/23 photogrammmetric camera was carried on Spacelab 1. The mission returned 1020 high resolution photographs in infrared false color or black and white over Asia, Africa, Europe and the Americas. The images are suitable for topographic and thematic mapping at the scale 1:100,000. A reflight with higher resolution is planned on the NASA EOM-1 mission in June 1985. Author (ESA)

N85-14231# Politecnico di Milano (Italy). Ist. di Topagrafia, Fotogrammetria e Geofisica.
METRIC EVALUATION OF SAR-580 OPTICAL IMAGES FOR CARTOGRAPHIC PURPOSES
G. Togliatti and A. Moriondo *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 251-255 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The planimetric errors of 358 points identifiable on the X-band of SAR-580 images were compared with a ground truth supplied by aerial triangulation of a photogrammetric block. Remarkable systematic behavior found in flight and across directions were removed with analytical and stochastical computations. The initial errors, amounting to several tens of meters, are reduced to 6 m in flight and 5 m in slant direction. The quantitative analysis shows poor definition of details, houses and cultivation limits being very difficult to identify. Cartographic applications are severely hindered by systematic deformation, revision by difficult identification of features. Author (ESA)

N85-14232# National Board for Scientific and Technological Research, Lisbon (Portugal). Outer Space Portuguese Committee.
REMOTE SENSING DATA IN SUPPORT OF CONVENTIONAL DATA
M. M. Loureiro *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 259-261 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The use of remote sensing data in agriculture and forestry, environmental protection, and fisheries is discussed. The need for improved spatial resolution and systems reliability to enable remote sensing to meet cost benefit specifications is emphasized. Author (ESA)

N85-14233# Technische Univ., Graz (Austria). Inst. for Image Processing and Computer Graphics.
A GEOINFORMATION EXPERT SYSTEM FOR SYNERGETIC USE OF MAP AND IMAGE DATA
H. Ranzinger and M. Ranzinger *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 263-268 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The software modules of a geocoded data base to handle remote sensing, map, and ancillary data are described, and development of an expert system for data analysis is proposed. The system comprises the digital compilation, storing and processing of spatial Data (DESBOD), a terrain model, and an image processing system. The DESBOD subsystems include an interactive manual digitizing system, a spatial and alphanumeric data base, and an interactive data analysis and display module. Each of the system components is autonomous and can be used independently. Author (ESA)

N85-14234# Natural Environment Research Council, Swindon (England). Thematic Information Service.
A METHODOLOGY FOR AN INTEGRATED SPATIAL DATA MODEL AND ITS APPLICATION TO IMAGE CLASSIFICATION
M. J. Jackson *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 269-273 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A methodology and model for the integrated processing of image, point, line and polygon data sets within a single geographic information system using remote sensing are outlined. It is argued that effective image analysis requires a balanced system which allows digital map and remotely sensed data to be analyzed together. The system needs to be interactive with the user inputing specialist expertise to the image classification procedure. An intelligent knowledge based approach is proposed. An example of image classification within the proposed framework is given. Author (ESA)

N85-14235# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ERS-1 AND ITS POTENTIAL FOR INDUSTRIAL UTILIZATION
U. Erich and D. H. Gottschalk *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 275-280 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The ERS-1 ESA satellite, its microwave instrumentation, ground segment, and data products are described. User groups are characterized and results of benefit calculations for ERS-1 are presented with reference to relevant SEASAT results. The prime center, as an interface between the satellite system and the end user, was investigated and found to be a suitable instrument to support case study activities during the preoperational phase and operational service. Industries involved in offshore activities are expected to be major users of ERS-1 data products. Author (ESA)

N85-14236# Centre National d'Etudes Spatiales, Toulouse (France). SPOT Image Center.
THE SPOT DATA BANK SYSTEM **c82**
J. P. Marc and J. P. LeGorgeu *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 281-286 (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The SPOT image catalog is described. It is the worldwide central depository for information concerning all raw data and products held in SPOT archives. Information concerning raw data is received from SPOT receiving stations while that concerning SPOT products is received from processing centers. The stations and centers are located all over the world. The raw data archive will store 700,000 raw scenes per year while the product archive is expected to store between 40,000 and 50,000 scenes per year. The image catalog offers users access to the general catalog of archived scenes, product ordering, and requesting of acquisition of raw data (special acquisition request or SAR) through special satellite scheduling. The image catalog can be accessed by users 24 hr a day, 365 days a year, via all major communications networks. Author (ESA)

N85-14237# Technische Univ., Munich (West Germany). Inst. for General and Applied Geology.
EVALUATION OF SPOT SIMULATION DATA OF THE S GEOS CAMPAIGN OF THE EEC BY DATA OF THE TEST SITES FREIBURG AND STAUBING (WEST GERMANY)
F. Jaskolla *In* ESA EARSeL/ESA Symp. in Integrative Approaches in Remote Sensing Aug. 1984 p 287-296 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Using SPOT similation data of S-GEOS Campaign of two agricultural-forestry test sites, the expected image quality improvements were investigated. Results show that spectral quality does not meet expectations. This is caused by the high correlation of band 1 (green) and band 2 (red). Real SPOT data, however, will benefit from better ground resolution and specially designed image processing techniques. Author (ESA)

N85-14238# Joint Research Centre of the European Communities, Ispra (Italy).
PERSPECTIVES OF REMOTE SENSING AT THE END OF THE DECADE
G. Fraysse *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 297-300 (For primary document

see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The situation of remote sensing in Europe and its evolution towards operational use are discussed. The availability of second generation Earth observation satellites provides European and developing countries with possibilities for the monitoring of their natural resources. Remote sensing is becoming a commercial technology. For new sensors two tendencies appear: automatic satellites totally or partially dedicated to experimental sensors and manned experiments carried by shuttles. Potential customers for remote sensing in the 1990's and alternatives for an efficient use of future satellites are considered. Limitations and constraints that European and developing countries have to solve before an operational use of remote sensing technology is feasible are outlined. Author (ESA)

N85-14239# Joint Research Centre of the European Communities, Ispra (Italy).
COMBINING HEAT CAPACITY MAPPING MISSION (HCMM) LANDSAT AND THEMATIC MAP INFORMATION INTO A UNIQUE HIGH PRECISION MERGED MULTICHANNEL SYSTEM
D. R. GallideParatesi, H. Gossmann (Freiburg Univ., West Germany), and M. Lehner (DFVLR, Oberpfaffenhofen, West Germany) *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 303-309 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Interpretation of satellite surface temperature patterns for climatology by combining them with ground measurements and additional thematic information layers is discussed. Changes in surface temperature due to land use modification, influence of relief on the nighttime heat balance of forests, sensible heat flux and air filtering efficacy, substitution of phenological climate indicators by satellite thermal imagery, wind-induced horizontal heat movements within extended industrial areas and use of a radar image as a topographical underpin for the interpretation of the thermal satellite imagery are considered. Combining geophysical information obtained by satellite and conventional thematic maps into a high-precision digital multilayer data system appears to be a suitable methodological procedure for investigating climatology at subregional level, related to natural and anthropogenic heat movements and release. The use of remote sensing data as multisource space information in support of conventional data looks very promising for practical applications. Author (ESA)

N85-14240# Technische Univ., Graz (Austria).
COMBINATIONS OF REMOTE SENSING DATA WITH A DIGITAL MAP DATA BASE
M. Ranzinger and H. Ranzinger *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 311-316 refs (For primary document see N85-14202 05-43)
(Contracts ERO-DAJA-45-83-C-0022; ERO-DAJA-45-84-C-0011)
Avail: NTIS HC A17/MF A01

The capabilities of a geoinformation system which handles digital image data, spatial data derived from maps, and digital terrain models are illustrated by a case study. The suitability for recreation facility planning is evaluated using a model with different kinds of thematic data including multitemporal LANDSAT MSS images, a digital terrain model, a map showing pollution stress zones, and a map of administrative boundaries. Computations carried out on raster data are integrated into the geoinformation data base. Author (ESA)

N85-14241# Universite Catholique de Louvain (Belgium). Lab. de Teledetection.
A FIELD CONTROL METHODOLOGY OF REMOTELY SENSED DATA FOR STATISTICAL PURPOSES: AN EXAMPLE OF SPOT SIMULATED DATA IN EASTERN BELGIUM
Et. Bartholome *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 317-323 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The use of remotely sensed data for the generation of land use statistics, particularly agriculture, was assessed using SPOT simulation data. Field data collection and delivery of results were examined. If systematic field surveys are not made to classify the image with a good level of accuracy, it is important to realize a careful space stratification according to the variables influencing the spectral signature (altitude, exposition, climatology, soil : hydric comportment and kind of material). The classified data can be delivered as synthetic thematic maps and/or surface percentages cell by cell across a standard grid. Author (ESA)

N85-14242# Florence Univ. (Italy). Dipt. di Ingegneria Elettronica.
APPLICATION OF HIGH FREQUENCY 2-D DIGITAL FILTERING TO REMOTE SENSING IMAGE PROCESSING
V. Cappellini *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 325-326 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Use of two dimensional digital filters for correction, smoothing, enhancement and preprocessing of remotely sensed images before data compression or pattern recognition is discussed. Applications of FIR and IIR filters are compared. The FIR filters are simpler to design and present linear phase responses, but require a higher number of coefficients; IIR filters require a more complex designing procedure and have stability problems. Author (ESA)

N85-14243# Reading Univ. (England). Dept. of Geography.
THE NEED FOR INTEGRATING GROUND THERMAL MEASUREMENTS WITH THERMAL AIRCRAFT IMAGERY
David W. Lynn *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 327-334 refs Sponsored by UK National Environment Research Council (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

The collection, analysis and interpretation of ground thermal measurements for a variety of soils in a humid temperate climate for image acquisition scheduling and as an aid to image interpretation are outlined. Results indicate that maximum surface radiant temperatures for soils occur between 14.30 and 15.30 hr. Maximum temperatures in the upper 10 cm of soil occur 2.5 hr later. Minimum surface radiant temperatures occur before sunrise. Surface radiant temperatures of different soils are very similar during the predawn and noon periods. Author (ESA)

N85-14244# Technische Univ., Munich (West Germany). Working Group Geoscientific Remote Sensing.
A MULTIPLE APPROACH IN REMOTE SENSING FOR STRUCTURAL AND LITHOLOGICAL MAPPING BY USE MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS) /LANDSAT/HEAT CAPACITY MAPPING MISSION (HCMM) DATA
H. Kaufmann *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 337-347 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

A concept for processing and presenting HCMM, LANDSAT, and Modular Optoelectronic Multispectral Scanner data for studies of geological structures is outlined. Using digital image processing techniques, data are prepared for structural and lithological mapping, and optimized for qualitative and quantitative analysis. These data, of different sensors acquired in multispectral and multitemporal mode, are used to correlate surface features and localized with their expression in satellite imagery. Images from semiarid and arid zones are shown. Author (ESA)

N85-14245# Exmoor National Park Dept., Dulverton (England).
INVENTORY AND MONITORING OF NATIONAL PARK LANDSCAPES
L. F. Curtis *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 349-352 refs (For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

Inventory and monitoring of National Park landscapes was

carried out by ground surveys and remote sensing, particularly aerial survey and satellite data analysis. Examples of aerial survey, satellite data analysis and SAR 580 experiments for landscape management in a National Park are discussed. Recommendations for integration of support services to assist operational use of remote sensing data are made. Author (ESA)

N85-14246# Kingston Polytechnic, Kingston-Upon-Thames (England). School of Electronic Engineering and Computer Science.

THE ROLE OF EXPERT SYSTEMS IN REMOTE SENSING

G. G. Wilkinson and P. F. Fisher *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 353-360 refs (For primary document see N85-14202 05-43) Avail: NTIS HC A17/MF A01

Data processing in operational remote sensing and the role which could be played by expert systems in improving data throughput and the reliability and value of end products are considered. The magnitude of the data problem is assessed and the need for fully automated multisource data integration and interpretation is examined in the remote sensing context. Initiatives in information technology for fifth generation computing are discussed and the features of expert systems are elaborated. The operational remote sensing procedure is analyzed using data flow diagrams and the role of expert systems is specified. An example of an expert system node in agrometeorological remote sensing is given. It is concluded that expert systems could make a significant contribution in operational remote sensing, especially in developing countries, if given sufficient resources. Author (ESA)

N85-14247# South Carolina Univ., Columbia. Dept. of Geography.

MULTISPECTRAL REMOTE SENSING OF INLAND WETLANDS IN SOUTH CAROLINA: SELECTING THE APPROPRIATE SENSOR

John R. Jensen, Michael Hodgson, Eric J. Christensen (Du Pont (E. I.) de Nemours and Co., Aiken, S.C.), Halkard E. Mackey (Du Pont (E. I.) de Nemours and Co., Aiken, S.C.), and Rebecca R. Sharitz (Georgia Univ., Aiken, S.C.) 1984 22 p refs Presented at the Ann. Symp. on Machine Processing of Remotely Sensored Data, West Lafayette, Ind., 12-14 Jun. 1984 Submitted for publication

(Contract DE-AC09-76SR-00001)

(DE84-013951; DP-MS-84-30; CONF-8406173-1) Avail: NTIS HC A02/MF A01

The utility of remote sensing for mapping both local (SRP) and regional wetlands was investigated. Particular observations of stream delta areas, (using aircraft multispectral scanner (MSS) imagery and large scale aerial photography), the SRP river swamp, (using aircraft MSS and LANDSAT thematic mapper imagery), and the Savannah River watershed (using LANDSAT MSS imagery) are discussed. DOE

N85-14248# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.

ELECTRONIC SATELLITE IMAGING SYSTEM MOMS-ESA Final Report, May 1983

Dieter Meissner and Michael Hofmann Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 58 p refs Partly in GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-84-033; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

An airborne/spaceborne remote imaging instrument was developed. The mapping principle is based on electrical scanning with high resolution linear photo-arrays (pushbroom principle, CCD technology). By combining several similar modules the scanning is done in several pixel-coincide spectral channels between 0.45 and 1.05 micron wavelength. Any line length can be obtained using the double lens principle (at present 6912 pixels). The signals are corrected in real time for the different dark signals, for the different sensitivities of the single elements and for each lens transmittance. The digitized and corrected data are then stored on a high density tape. Author (ESA)

N85-14249# Ecole Nationale Superieure des Telecommunications, Paris (France).

IMAGE TEXTURE STUDY FOR THE OPERATIONAL METEOROLOGICAL SATELLITES NOAA 6 AND NOAA 7 AND ITS VARIATION WITH TIME. APPLICATION TO THE BEAUCE REGION Ph.D. Thesis [ETUDE DE LA TEXTURE DES IMAGES DES SATELLITES METEOROLOGIQUES OPERATIONNELS NOAA 6 ET NOAA 7 ET SA VARIATION DANS LE TEMPS APPLICATION A LA BEAUCE]

Fusak Cheevasuvit Jun. 1984 161 p refs Partly in FRENCH and ENGLISH

(ENST-84E009; ISSN-0751-1353) Avail: NTIS HC A08/MF A01

The evolution of the thermal structure and the vegetation index along the annual cycle were investigated by NOAA satellite infrared image processing. A flat agricultural region was studied. Adaptive threshold algorithms and binary correlation were used to obtain image congruence. Stable zones were determined by models based on the inertia ellipses and the evolution of their proximity in images processed by the split and merge procedure. The evolution of the thermal averages and the average vegetation indexes were estimated for stable zones by three different methods. It is shown that image homogenous areas can be identified with known natural regions: hills, forest and the Beauce Plateau. The Beauce Plateau has a thermal structure divided into three or more areas depending on the season. Author (ESA)

N85-13831# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/MS/CD.

THE MOTION OF THE EARTH BY DOPPLER OBSERVING CAMPAIGN (MEDOC) [EXPERIENCE MEDOC]

Y. Labrune *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 783-809 refs In FRENCH (For primary document see N85-13807 05-13)

Avail: NTIS HC A99/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-14250 Fachinformationszentrum fuer Energie, Physik, Mathematik G.m.b.H., Karlsruhe (West Germany).

INFORMATION PACKAGE ON PHOTOVOLTAICS [INFORMATIONSPAKET: PHOTOVOLTAIK]

Peter Heuschneider, ed. (Industrieanlagen-Betriebsgesellschaft, mbH), Dieter Kreuz, ed. (Industrieanlagen-Betriebsgesellschaft, mbH), Johanna Grewen, ed., and Rosa Hemmers, ed. Sep. 1983 220 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie

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An information package for users of photovoltaic energy conversion is presented. Battery energy storage using solar energy; techniques and apparatus for hydrogen production; fluorescence collectors; and application possibilities in housing or leisure are discussed. For individual titles, see N85-14251 through N85-14274.

N85-14251 Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).

STIMULATION OF TECHNOLOGIES TOWARDS PHOTOVOLTAIC ENERGY CONVERSION [FOERDERUNG VON TECHNOL-

OGIEN ZUR PHOTOVOLTAISCHEN ENERGIEUMWANDLUNG]
Klaus Jacobs *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 11-18 In GERMAN (For primary document see N85-14250 05-44)
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The utilization of technologies for photovoltaic energy conversion is discussed. The German Federal Ministry of Research and Technology plans to support industries working in the field of photovoltaic applications, with emphasis on cheaper production of solar cell generators based on crystalline silicon. Development aims include cost reduction in the production of polycrystalline silicon and production techniques for monocrystalline silicon; cheap production methods for solar cells with high reproducibility; and reliable shielding of generator modules against weather effects Author (ESA)

N85-14252 AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien.
PHOTOVOLTAIC POWER SUPPLY UNITS [PHOTOVOLTAISCHE STROMVERSORGUNGSANLAGEN]
Volker Cordes and Gert Schmidt *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 19-22 In GERMAN (For primary document see N85-14250 05-44)
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Photovoltaic power supply systems for terrestrial utilization are reviewed. The efforts to develop cheap photovoltaic systems are concentrated on basic materials (Si, CdS, GaAs); solar cells, modules, and generators; storage systems; and control and energy processing systems. Monocrystalline GaAs-solar cells are nearly exclusively used in highly concentrated systems; they reach efficiencies of 23 to 25%, but are expensive and not always available. The efficiency of Cu2S-CdS-solar cells is 9% maximum and their long term stability is not yet clearly demonstrated. Silicon solar cells reach an efficiency of 16% and are the favorite candidate for the development of cheap solar generators due to their high technological standard and their practically unlimited availability. Author (ESA)

N85-14253 Deutscher Wetterdienst, Hamburg (West Germany).
GLOBAL RADIATION IN WEST GERMANY [GLOBALSTRAHLUNG IN DEUTSCHLAND EIN KURZER UEBEBLICK] c47
Fritz Kasten *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 23-28 refs In GERMAN (For primary document see N85-14250 05-44)
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Global solar radiation in Germany is discussed with a view to the planning and economy of solar energy units. The global radiation measurement results cannot directly be used for photoreceivers whose spectral sensitivity differs significantly from the average global radiation spectrum. However, for these receivers a formula is given to convert the global radiation data into light-technical data. Global radiation with cloudless and cloudy sky, average daily and yearly global radiation, and geographical distribution of the global radiation are discussed. Author (ESA)

N85-14254 AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien.
DEVELOPMENT AND CONSTRUCTION OF A PROTOTYPE PHOTOVOLTAIC ENERGY SUPPLY UNIT [ENTWICKLUNG UND PROTOTYPENBAU VOTRE PHOTOVOLTAISCHEN ENERGIEVERSORGUNGSANLAGEN]
Volker Cordes *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 31-41 refs In GERMAN (For primary document see N85-14250 05-44)
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Development of solar cells and solar module technologies enabling a solar generator production cost of 5 DM/W; solar generators with a lifetime of > 20 yr; and a solar generator efficiency of 10% and reduction of system costs in order to obtain economical energy production costs are discussed. Silicon solar cells, solar generators, and system techniques and field tests are considered. The utilization of larger cells and larger modular units leads to savings. The proposed lifetime of 20 yr is obtained by encapsulation of the cells in glass. A module efficiency of 10% is obtained by the utilization of polycrystalline cells and encapsulation in glass. A system for optimal control in different power domains was developed. The hardware of the control systems was tested. The tendency towards large units with electric grid quality and supply to existing ac current grids is made clear. Author (ESA)

N85-14255 Siemens A.G., Munich (West Germany). UBB Bauelemente.
SIEMENS SOLAR MODULE: STATUS OF THE TECHNIQUE, DEVELOPMENT TENDENCIES [SIEMENS-SOLARMODULE. STAND DER TECHNIK, ENTWICKLUNGSTENDENZEN]
Fritz Cammerer and Reinhard Hollaus *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 42-45 In GERMAN (For primary document see N85-14250 05-44)
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Solar cells and solar modules were developed in order to find an economically optimized solution for photovoltaic energy supplies in the range 100 kWp. Silicon material and cell production costs are reduced (in connection with the achievable module efficiency). The characteristics of the silicon cell technology are presented. A very economically installable power module and a cheap module production method are described. Author (ESA)

N85-14256 NUKEM G.m.b.H., Hanau (West Germany).
DEVELOPMENT AND UTILIZATION OF CdS/Cu2S [ENTWICKLUNG UND EINSATZ VON (CdS/Cu2S) DUENNSCHICHTZELLEN]
Hans G. Bogensberger *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 46-53 refs In GERMAN (For primary document see N85-14250 05-44)
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Polycrystalline CdS/Cu2S solar cells were developed. The technological basis and the structure of CdS/Cu2S cells are explained. Advantages, electrical characteristics, and long term stability of thin film cells are discussed. Development aims (efficiency > 7% and single cell surfaces larger than 7x7 cm) are exceeded. Author (ESA)

N85-14257 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
SOLAR GENERATORS MADE OF AMORPHOUS SILICON [SOLARGENERATOREN AUS AMORPHEM SILIZIUM]
Helmut Paulke *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 54-57 In GERMAN (For primary document see N85-14250 05-44)
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Thin film solar cells based on amorphous silicon (a-Si) are described. These cells have an Si-layer thickness of 1 micron, thereby saving expensive Si-material. An additional advantage compared to the technology of crystalline Si is that fewer steps in the production of solar cells are required. Solar cells of 1 sq cm with an efficiency of 10% are obtained. Results concerning efficiency and long term stability of solar generators based on the concept of a-Si are encouraging; their weight is low (60 kg per installed kW) and they are flexible. In contrast to crystalline Si, a-Si does not show an efficiency decrease in regions with much sunshine. Author (ESA)

N85-14258 Fraunhofer-Inst. fuer Solare Energiesysteme, Freiburg (West Germany).
FUNDAMENTALS OF SOLAR ENERGY CONVERSION BASED ON FLUORESCENCE COLLECTORS [GRUNDLAGEN DER SOLARENERGIEUMWANDLUNG AUF DER BASIS VON FLUORESZENZKOLLEKTOREN]
Adolf Goetzberger and Volker Wittwer *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 59-70 In GERMAN (For primary document see N85-14250 05-44)
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Fluorescence collector-concentrators were investigated. The photovoltaic conversion degree of a combination of several collector plates and solar cells was calculated. Measurements were performed to determine loss mechanisms limiting the efficiency of real fluorescence collectors. The losses depend very strongly on the choice of transparent matrix and dyes. The stability of dyes in the transparent matrix was investigated. It is shown that it is not the decrease in dyes but the occurrence of an additional absorption in the fluorescence range that causes an efficiency loss. Stability measurements make it possible to optimize the dye-matrix system. Efficiency measurements on test collectors show lower values than expected since the solar cells were not suited for concentrated light. The thermal conversion of concentrated fluorescent light is successful. Author (ESA)

N85-14259 Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Abteilung EA.

BIAXIAL TRACKING SOLAR GENERATOR [ZWEIACHSIG NACHGEFUEHRTER SOLARGENERATOR]

In Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 71-72 In GERMAN (For primary document see N85-14250 05-44)

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A prototype of a biaxial sun tracking solar generator, called solar pump is presented. Compared with other generators, 40% higher yields are obtained. A module with 20 solar cells delivers 2.7 kW electric power for a nominal radiation of 100 W/sqm. The tracking is controlled by a sensor. The required tracking energy is below 2% of the generator production. The platform surface is 40 sqm. Author (ESA)

N85-14260 Varta Batterie A.G., Hagen (West Germany).

ENERGY STORAGE WITH LEAD ACID BATTERIES IN PHOTOVOLTAIC SYSTEMS [ENERGIESPEICHERUNG MIT BLEIAKKUMULATOREN IN PHOTOVOLTAISCHEN SYSTEMEN]

Hartwig Willmes *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 73-77 In GERMAN (For primary document see N85-14250 05-44)

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The utilization of lead acid batteries in photovoltaic systems for electric energy supply is discussed. Batteries plus control cover 20% to 30% of a solar generator installation. A drastic cost reduction for lead acid batteries is not expected. Alternative accumulator systems with comparable qualities cannot be expected in the next 10 yr. Nickel cadmium batteries are not used in solar techniques since the charging current of photovoltaic generators is too low. Economic hybrid energy supply systems can be obtained by a combination of fossil fuels and regenerative energy sources following the fuel saver principle. The dimensioning of solar energy systems is discussed. Author (ESA)

N85-14261 Accumulatorenfabrik Sonnenschein G.m.b.H., Buedingen (West Germany).

ENERGY STORAGE FOR STATIONARY AND MOBILE OPERATION AS A BUFFER OF POWER SUPPLY FROM ADDITIVE ENERGY SOURCES [ENERGIESPEICHER FUER STATIONAERE UND MOBILEN BETRIEB ZUR PUFFERUNG VON STROMVERSORGUNGEN AUS ADDITIVEN ENERGIEQUELLEN]

Reinhard Blaser *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 78-86 In GERMAN (For primary document see N85-14250 05-44)

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Maintenance free energy systems were developed as a power supply buffer for additive energy systems (solar, wind, tidal), based on conventional products. The dryfit A 600 solar battery withstood 1000 daily cycles during field tests. For storage over longer periods (weeks, months) for systems above 150 Ah the A 600 solar was shown to be the best technical solution. For smaller system an improved conventional battery type (dryfit A 200) with fixed electrolytes was suitable. Charging technique and battery monitoring are explained. A computer program for system measurement and system optimization was developed. Author (ESA)

N85-14262 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.

UTILIZATION OF SOLAR ENERGY FOR THE PRODUCTION OF HYDROGEN [NUTZUNG DER SONNENENERGIE ZUR HERSTELLUNG VON WASSERSTOFF]

Hartmut Steeb, Werner Kleinkauf (Gesamthochschule, Kassel, West Germany), and Achim Mehrmann (Gesamthochschule, Kassel, West Germany) *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 87-97 refs In GERMAN Presented at 4th Intern. Sonnenforums, Berlin, 1982 (For primary document see N85-14250 05-44)

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The combination of photovoltaic solar generators and electrolyzers for hydrogen production was investigated. Two different small solar-hydrogen systems are described. The coupling of photovoltaics and electrolysis; the mode of operation of a unit for power processing; and practical operation experiences are discussed. The proposed active electronic adaptation unit can improve photovoltaic electrolyse systems. Solar energy can be converted into the energy carrier hydrogen with a total yearly average efficiency of 16%. This corresponds to 23 Ncum hydrogen per sqm active solar cell surface for a yearly radiation of 1000 kWh/sqm. Author (ESA)

N85-14263 Wirtschaft und Infrastruktur G.m.b.H. und Co. Planungs-KG, Munich (West Germany).

THE 15 PHOTOVOLTAIC PILOT PROJECTS OF THE EUROPEAN COMMUNITIES [DIE 15 PHOTOVOLTAIC PILOT-PROJEKTE DER EG]

Klaus Traeder *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 101-103 In GERMAN (For primary document see N85-14250 05-44)

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Photovoltaically driven power systems in the range between 30 and 300 kW, organized and cofinanced by the Commission of the European Communities, are discussed. Besides demonstration projects program purposes are: development of photovoltaic systems and their components for applications under different environmental conditions; direct comparison of different solutions for similar technical problems; supply of data for technical economic optimization of future systems; determination of the maintenance effort of photovoltaic power plants; and integration of systems in existing power distribution grids. A 5 yr data acquisition program accompanies these research projects. Author (ESA)

N85-14264 Fernmeldeamt 3, Munich (West Germany).

TELEPHONING WITH LIGHT AND SUN [TELEFONIEREN MIT LICHT UND SONNE] c32

Johann Nussbaum *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 104-107 In GERMAN (For primary document see N85-14250 05-44)

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A technology with glass fibers and solar cells was tested under extreme weather conditions in order to develop a telephone system for the mountains. A metal free cable made of glass fibers, a communication medium, and a carrier made of plastic which has a higher tensile strength than steel was developed. Cables were installed in the Bavarian Alps with solar panels as energy supply. The dimensioning and characteristics of the solar generator Alpine Telephone are presented. Experience during the winter shows that solar panels and batteries are sufficiently dimensioned and function satisfactorily even under extreme temperature conditions. The telephone system performed satisfactorily.

Author (ESA)

N85-14265 Stiftung Bjoern Steiger e.V., Winnenden (West Germany).

ENERGY SUPPLY PROBLEMS FOR EMERGENCY TELEPHONES [ENERGIEVERSORGUNGSPROBLEME BEI NOTRUFTELEFONEN]

Siegfried Steiger *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 108-112 In GERMAN (For primary document see N85-14250 05-44)
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The energy supply for isolated emergency telephones is discussed. The required energy for telephoning is so low that dry batteries are used. An illumination was necessary to recognize and find these telephones. Besides reflecting foils, five energy supplies are used: cable connection to the public electric grid, dry batteries, rechargeable batteries, solar energy, and chemical sources. A solar generator (40W, 12V) was developed. Tests show that an 80W solar generator and 200 A/hr buffer batteries are required. The utilization of these generators could be endangered by theft. Author (ESA)

N85-14266 Siemens A.G., Erlangen (West Germany). Bereich Energietechnik.
PHOTOVOLTAIC 100 kWp PILOT PLANT ON THE GREEK ISLAND KYTHNOS [PHOTOVOLTAISCHE PILOTANLAGE 100 kWp AUF DER GRIECHISCHEN INSEL KYTHNOS]
In Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 113-115 In GERMAN (For primary document see N85-14250 05-44)
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The solar energy equipment for a pilot plant is described. The solar field consists of 800 solar modules each containing 144 monocrystalline silicon cells. The circuitry of the solar modules is described. In each 25 kW branch a dc voltage transformer is provided for load matching to the required storage battery. Three 50 kVA inverse rectifiers are added in order to adapt the dc current to the existing consumer grid. The storage battery is equipped with an electronic charge state control. Author (ESA)

N85-14267 Fraunhofer-Inst. fuer Solare Energiesysteme, Freiburg (West Germany).
MAINS-CONNECTED PHOTOVOLTAIC SYSTEM FOR A HOUSE [NETZGEKOPPELTE PHOTOVOLTAIK-ANLAGE FUER EIN WOHNGEBAEUDE]
Juergen Schmid and Adolf Goetzberger *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 116-123 refs In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

Tests were conducted on a residence equipped with mains photovoltaic electric energy supply system to assess components under realistic conditions, to determine installation effort, and to find solutions for integration of solar cells in house roofs. The technical design of the photovoltaic system is described. When solar radiation is high the solar cells cover a considerable part of the energy consumption and deliver superfluous energy to the mains. The mains supplies energy in case of low radiation. Author (ESA)

N85-14268 AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien.
PROJECT PELLWORM: SOLAR ELECTRIC ENERGY SUPPLY FOR A HEALTH CENTER [PROJEKT PELLWORM: SOLARELEKTRISCHE ENERGIEVERSORGUNG FUER EIN KURZENTRUM]
Hans-Juergen Lowalt *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 124-130 In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

A solar electric energy supply system with 300 kW peak power dc voltage was built. Superfluous energy can be supplied to the mains. For energy supply during the night or bad weather a battery of 6000 A/hr at 346 V is provided. A connection to the mains in case of emergency is possible. The energy from the solar generator is nearly loss-free, and is supplied to the consumer with three phase high voltage in the kV-range. A microprocessor system is used for the coordination of the global energy fluxes. The season determined energy requirement of the center is ideally adapted to the solar energy offered over the year. Author (ESA)

N85-14269 Klein, Schanzin und Becker A.G., Frankenthal (West Germany). Geschaeftsbereich Serienpumpen.
PHOTOVOLTAIC PUMP SYSTEMS [PHOTOVOLTAISCHE PUMPENSYSTEME]
Juergen Klockgether and Karl P. Kiessling *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 133-137 In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

Solar pump systems for the irrigation of fields and for water supply in regions with much sunshine are discussed. For surface water and sources with a hoisting depth of 12 m, a system with immersion pumps is used. For deep sources with larger hoisting depths, an underwater motor pump was developed. Both types of pump system meet the requirements of simple installation and manipulation, safe operation, maintenance free, and high efficiency reducing the number of solar cells needed. Author (ESA)

N85-14270 Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
SOLAR ENERGY SUPPLIED MOBILE WATER PURIFICATION UNIT [SOLARBETRIEBENE, MOBILE TRINKWASSERAUFBEREITUNGSANLAGE]
Klaus Speidel *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 138-141 In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

Energy self supporting water purification systems for developing countries were developed. A prototype with reduced energy requirements was built, making solar energy supply of such units economically attractive. The prototype delivers 10 to 12 cum drinking water per day, sufficient for about 1000 inhabitants. The solar field design is based on an average radiation of 4 to 4.5 kWh/sqm per day. A storage battery covers lack of sunshine during 2 days out of 10. Water treatment is done by the upward filtration method, which is especially suited for minimization of the required energy. Maintenance is very limited. Author (ESA)

N85-14271 AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien.
REALIZED FIELD TESTS [AUSGEFUEHRTE FELDERPROBUNGEN]
Volker Cordes *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 143-145 In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

Three solar generator projects in developing countries are discussed. A brackish water desalination unit was developed and built. A 2.4 kW solar generator supplies the desalination unit which produces 1.5 cum drinking water per day, and the pump installed for a hoisting depth of 20 m. The unit switches on if the solar energy is sufficiently high; a 160 Ahr battery guarantees constant operation. A photovoltaically supplied UHF transmitter was installed. A 3.6 kW solar generator and a battery make transmitter and air traffic warning illumination self-sufficient. A small diesel generator is installed for emergency cases. Experience shows that solar generator (4 kW) and battery have to be enlarged. An emergency solar energy generator was installed in a hospital. The solar generator has a maximum power of 150 W; together with a battery it can deliver the energy for a minimum 5 hr of emergency illumination. Author (ESA)

N85-14272 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
UTILIZATION POSSIBILITIES OF PHOTOVOLTAICS IN THE PRIVATE SECTOR [EINSATZMOEGLICHKEITEN DER PHOTOVOLTAIK IM PRIVATBEREICH]
Peter Heuschneider *In* Fachinformationszentrum fuer Energie,

Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 149-154 refs In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

Utilization possibilities of photovoltaic electric generators in the private sector are discussed. It is clear that in all cases where the mains is available, photovoltaic systems can as a rule not be an economical alternative. There exist nevertheless applications for which photovoltaics are an attractive source of electric energy, namely the cases where W and not kW are required and where the mains is not available or its installation is too complicated. Possible applications for solar systems include: supply of weekend houses, mobile homes, and ships. Author (ESA)

N85-14273 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
CONSIDERATIONS ON THE DIMENSIONING OF PHOTOVOLTAIC SUPPLY SYSTEMS IN THE LOW POWER RANGE [UEBERLEGUNGEN ZUR DIMENSIONIERUNG PHOTOVOLTAISCHER VERSORGUNGSSYSTEME IM KLEINLEISTUNGSBEREICH]
Dieter Kreuz *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 155-166 refs In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

Solar radiation data and a simplified calculation method for rough dimensioning of photovoltaic energy supplies based on these data are presented. The German meteorological services provide the average monthly and yearly global solar radiation for several regions. The energy yield of solar panels and additional effects on the energy yield are treated. The method is not intended for the development of large units but it is suited as a rough calculation for smaller units. Author (ESA)

N85-14274 AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien.
SOLAR POWER SUPPLIES FOR SHIPS [SOLARE STROMVERSORGUNG FUER BOOTE]
Heinz Groth *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 167-168 In GERMAN (For primary document see N85-14250 05-44)
Copyright. Avail: Issuing Activity

A solar generator to charge batteries onboard yachts was developed. The solar generator generally consists of several modules. The 12 V battery is charged via a charging controller. The smallest unit delivers 10 W maximum at full sunshine. The modular construction makes voltage and power variable. An increased energy requirement can be covered by connecting more modules in parallel. In case of battery failure the solar generator can feed essential equipment directly during the day.Author (ESA)

N85-14275# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
MATERIAL MODELS AND DEVICE STRUCTURES FOR GaAs SOLAR CELLS M.S. Thesis. Interim Report
Christine M. Maziar Sep. 1984 155 p refs Sponsored in part by Midwest Research Inst.
(Contract DE-AC02-83CH-10093)
(DE85-000501; SERI/STR-211-2412) Avail: NTIS HC A08/MF A01

The GaAs as a solar cell material which promises high conversion efficiencies was examined. Advantages of GaAs over Si as a photovoltaic material are: (1) a bandgap that is better matched to the solar spectrum; (2) superior performance at high operating temperatures; and (3) radiation resistance properties. A computer program modeling the essential device physics is desirable for analysis and optimization of cell designs. The utility of such a program was demonstrated and the developed code was extended for analysis of GaAs cells. The development and assembling of models for material parameters for GaAs relevant to photovoltaic applications, and identification of these material parameters and properties which require further experimental and theoretical investigation is described. For individual titles, see N85-14276 through N85-14279.

N85-14276# Purdue Univ., Lafayette, Ind.
MATERIAL MODELS AND DEVICE STRUCTURES FOR GaAs SOLAR CELLS, INTRODUCTION
In its Mater. Models and Device Struct. for GaAs Solar Cells Sep. 1984 p 1-19 (For primary document see N85-14275 05-44)
Avail: NTIS HC A08/MF A01

A computer simulation model for gallium arsenided based photovoltaic devices was developed from three observations: (1) GaAs cells have a high potential for large conversion efficiencies; (2) that potential was demonstrated; (3) the use of complete computer model for silicon solar cells was successful. Gallium arsenide displays several strengths as a photovoltaic material. This material is attractive for use in space because of its resistance to radiation. Minority carries in GaAs have such short lifetimes when compared to those of Si that the additional recombination mechanisms introduced by defects caused by exposure to high energy radiation do not appreciably compete with the existing recombination mechanisms. The following derived from a complete computer model of GaAs cells, are much the same as those for a Si model: (1) facilitates the optimization of cell design, (2) improves the cell designer's ability to analyze experimental data and establish which cell performance characteristics are design dependent and which are technology dependent, (3) enable the cell designer to look into the cell to allow access to information which would otherwise have to be inferred from experimentally determined terminal characteristics of the device, (4) the code for Si has already been developed and extension to GaAs is straightforward after new material models are developed. E.A.K.

N85-14277# Purdue Univ., Lafayette, Ind.
GaAs MATERIAL PROPERTIES AND MODELS
In its Mater. Models and Device Struct. for GaAs Solar Cells Sep. 1984 p 20-81 (For primary document see N85-14275 05-44)
Avail: NTIS HC A08/MF A01

Material parameters and models for GaAs and their relationship to solar cell device performance were compiled. The absorption coefficient and intrinsic carrier density, and the physical mechanisms which underlie their existence are investigated all parameters are given for 300 K. The assumptions made when working with silicon are accepted agarute; areas and applications for which these assumptions may not be made for gallium arsenide are pointed out. E.A.K.

N85-14278# Purdue Univ., Lafayette, Ind.
ANTI-REFLECTION COATINGS MATERIALS AND MODELS
In its Mater. Models and Device Struct. for GaAs Solar Cells Sep. 1984 p 82-99 (For primary document see N85-14275 05-44)
Avail: NTIS HC A08/MF A01

Two materials used as antireflection coatings for GaAs solar cells, Al sub Ga sub (1-x)As and a native anodically grown oxide were examined. The justification for treating Al sub Ga(1-x)As as a material for antireflection coatings may be found in an examination of the heteroface cell. So few carriers are generated in the wide band gap window that it may simply be treated as a component of the antireflection system. To characterization of a material for use in an antireflection coating demands the knowledge of both the refractive index, n, and the extinction coefficient, k, over the solar spectrum. E.A.K.

N85-14279# Purdue Univ., Lafayette, Ind.
COMPARISON OF SCAPID/GaAs TO EXPERIMENT
In its Mater. Models and Device Struct. for GaAs Solar Cells Sep. 1984 p 100-121 (For primary document see N85-14275 05-44)
Avail: NTIS HC A08/MF A01

The SCAPID with GaAs extension were used to simulate real devices, and the results of the computer simulation to those determined experimentally were compared. Experimental cells which are complete in the description of the cell and in the description of the cell analysis are described. A homojunction

GaAs cell was analyzed. It is demonstrated that SCAPID can be applied to GaAs solar cells. The importance of including a reflection model within the code rather than simply relying on a lumped shadow factor is indicated. E.A.K.

N85-14280*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SITE-SPECIFIC RESEARCH CONDUCTED IN SUPPORT OF THE SALTON SEA SOLAR POND PROJECT, FY 1982 REPORT
R. L. French, H. E. Marsh, E. J. Roschke, and Y. C. Wu 1 Sep. 1984 109 p refs Prepared for DOE, Washington, D.C.
(Contract DE-AI03-82SF-11592)
(NASA-CR-174182; JPL-Pub-84-68; NAS 1.26:174182; DOE/SF-11592/1) Avail: NTIS HC A06/MF A01 CSCL 10A

The design and operation of a salt-gradient solar pond power plant at the Salton Sea presents problems not encountered at small research ponds that were built in the United States. The specific characteristics of the Salton Sea site and the desire to construct the pond using the local clay as a sealant represent major deviations from previous solar pond experience. The site-specific research in support of the plant design is described. The research activity included validation of the spectrophotometric light transmission measurement technique, a search for options for clarifying the turbid and colored water of the Salton Sea, development of water clarification specifications in terms common to industry practice, quantification of gas production from microbiological reactions in the ground, a determination of the combined effects of temperature and salinity on the permeation of the local clays, and a preliminary evaluation of material corrosion. For individual titles, see N85-14281 through N85-14285.

N85-14281*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LABORATORY INVESTIGATIONS
In its Site-Specific Res. Conducted in Support of the Salton Sea Solar Pond Proj., FY 1982 Rept. 1 Sep. 1984 31 p (For primary document see N85-14280 05-44)
Avail: NTIS HC A06/MF A01 CSCL 10A

The primary objectives were to examine the site-specific physical, chemical, and biological factors that impact construction, durability and performance of the proposed 5-MW (sub e) solar pond system at the Salton Sea. The interactions of the water, salt, and soil of the site and on material compatibility were examined. Potential interactions of the water/brine and soil are particularly important because the pond will utilize the naturally occurring clays as a bottom seal. Although there is a considerable and growing solar pond literature, little written information deals with the important site-specific investigations of water, salt, and soil. Therefore, technical effort was directed toward identifying the factors that should be investigated and determining methods of investigation. As a result, a by-product was the development of an approach for site-specific investigations and some specific methodologies. This development should continue in order to establish a generic approach for evaluating the suitability of any site for the construction of large-scale solar ponds. B.G.

N85-14282*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYTICAL MODELS
In its Site-Specific Res. Conducted in Support of the Salton Sea Solar Pond Proj., FY 1982 Rept. 1 Sep. 1984 4 p (For primary document see N85-14280 05-44)
Avail: NTIS HC A06/MF A01 CSCL 10A

A system-level design and analysis model was developed. This model was conceived to have several key elements: a solar pond thermodynamic performance model, a power generation subsystem model, and an economic analysis element. The basic approach was to create these elements or modules and refine them on an individual basis yet retain the capability to easily couple them into a full system design model. This building block approach allows for maximum flexibility and substitution of refined descriptions as the technology develops. A general overview of interconnecting these subsystem models is presented. The primary program control element will perform the administrative functions of data input, data output, information storage and transfer, and sequential calling of the subsystem models. From the point of view of the requirements of a system design model, a power conversion subsystem model was developed. The goal of the effort was a preliminary subsystem model compatible with the solar pond subsystem model so that a first order system simulation analysis could be performed. B.G.

N85-14283*# Department of Energy, Washington, D. C.
THE SPECTROPHOTOMETRIC METHOD OF DETERMINING THE TRANSMISSION OF SOLAR ENERGY IN SALT GRADIENT SOLAR PONDS Final Report
James Giulianelli *In* JPL Site-Specific Res. Conducted in Support of the Salton Sea Solar Pond Proj., FY 1982 Rept. 1 Sep. 1984 41 p refs (For primary document see N85-14280 05-44)
Avail: NTIS HC A06/MF A01 CSCL 10A

In order to predict the thermal efficiency of a solar pond it is necessary to know total average solar energy reaching the storage layer. One method for determining this energy for water containing dissolved colored species is based upon spectral transmission measurements using a laboratory spectrophotometer. This method is examined and some of the theoretical ground work needed to discuss the measurement of transmission of light water. Results of in situ irradiance measurements from oceanography research are presented and the difficulties inherent in extrapolating laboratory data obtained with ten centimeter cells to real three dimensional pond situations is discussed. Particular emphasis is put on the need to account for molecular and particulate scattering in measurements done on low absorbing solutions. Despite these considerations it is expected that attenuation calculations based upon careful measurements using a dual beam spectrophotometer technique combined with known attenuation coefficients will be useful in solar pond modeling and monitoring for color buildup. Preliminary results using the CSM method are presented. Author

N85-14284*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MATERIAL SELECTION CONSIDERATION FOR SOLAR PONDS
S. Sastri (New York City Technical Coll.), T. K. Vaidyanathan (New York Univ. Dental Center), H. E. Marsh, and R. French *In its* Site-Specific Res. Conducted in Support of the Salton Sea Solar Pond Proj., FY 1982 Rept. 1 Sep. 1984 16 p (For primary document see N85-14280 05-44)
Avail: NTIS HC A06/MF A01 CSCL 10A

Among the various candidate materials tested, stainless steel shows the best potential for applications as heat exchanger components in solar ponds. Even stainless steel may lead to pitting type of corrosion. Weight loss measurements are probably unsatisfactory for corrosion evaluation in solar pond situations. Also included are the results from the potentiodynamic anodic polarization analysis, corrosion rate calculation via corrosion behavior diagrams, and immersion weight loss measurements. B.G.

N85-14285*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SUMMARY DESCRIPTION OF A COMPUTER PROGRAM CONCEPT FOR THE DESIGN AND SIMULATION OF SOLAR POND ELECTRIC POWER GENERATION SYSTEMS
In its Site-Specific Res. Conducted in Support of the Salton Sea Solar Pond Proj., FY 1982 Rept. 1 Sep. 1984 8 p (For primary document see N85-14280 05-44)
Avail: NTIS HC A06/MF A01 CSCL 10A

A solar pond electric power generation subsystem, an electric power transformer and switch yard, a large solar pond, a water treatment plant, and numerous storage and evaporation ponds. Because a solar pond stores thermal energy over a long period of time, plant operation at any point in time is dependent upon past operation and future perceived generation plans. This time or past history factor introduces a new dimension in the design process. The design optimization of a plant must go beyond

examination of operational state points and consider the seasonal variations in solar, solar pond energy storage, and desired plant annual duty-cycle profile. Models or design tools will be required to optimize a plant design. These models should be developed in order to include a proper but not excessive level of detail. The model should be targeted to a specific objective and not conceived as a do everything analysis tool, i.e., system design and not gradient-zone stability. Author

N85-14286*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SALT-GRADIENT SOLAR PONDS: SUMMARY OF US DEPARTMENT OF ENERGY SPONSORED RESEARCH
R. L. French, D. H. Johnson (Solar Energy Research Inst.), G. F. Jones (Los Alamos National Lab.), and F. Zangrando (Solar Energy Research Inst.) Aug. 1984 165 p refs Prepared for DOE, Washington, D.C.
(Contract DE-AI03-82SF-11592)
(NASA-CP-174183; JPL-Pub-84-74; NAS 1.26:174183; DOE/SF-11592/2) Avail: NTIS HC A08/MF A01 CSCL 10A

The solar pond research program conducted by the United States Department of Energy was discontinued after 1983. This document summarizes the results of the program, reviews the state of the art, and identifies the remaining outstanding issues. Solar ponds is a generic term but, in the context of this report, the term solar pond refers specifically to saltgradient solar pond. Several small research solar ponds have been built and successfully tested. Procedures for filling the pond, maintaining the gradient, adjusting the zone boundaries, and extracting heat were developed. Theories and models were developed and verified. The major remaining unknowns or issues involve the physical behavior of large ponds; i.e., wind mixing of the surface, lateral range or reach of horizontally injected fluids, ground thermal losses, and gradient zone boundary erosion caused by pumping fluid for heat extraction. These issues cannot be scaled and must be studied in a large outdoor solar pond. For individual titles, see N85-14287 through N85-14292.

N85-14287*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR POND OVERVIEW
R. L. French, ed., F. Zangrando (Midwest Research Inst.), D. H. Johnson (Midwest Research Inst.), and G. F. Jones (Los Alamos National Lab.) *In its* Salt-Gradient Solar Ponds Aug. 1984 19 p refs (For primary document see N85-14286 05-44)
Avail: NTIS HC A08/MF A01 CSCL 10A

The term solar pond is used to refer specifically to a salt-gradient solar pond. A technology assessment was done consisting of thermal performance; maintenance; applications; and economics. Research needs and recommendations were also included. B.G.

N85-14288*# Los Alamos Scientific Lab., N. Mex.
SOLAR POND FLUID DYNAMICS AND HEAT TRANSFER
G. F. Jones *In* JPL Salt-Gradient Solar Ponds Aug. 1984 33 p refs (For primary document see N85-14286 05-44)
Avail: NTIS HC A08/MF A01 CSCL 10A

The primary objective of the solar pond research was to obtain an indepth understanding of solar pond fluid dynamics and heat transfer. The key product was the development of a validated one-dimensional computer model with the capability to accurately predict time-dependent solar pond temperature, salinities, and interface motions. Laboratory scale flow visualization experiments were conducted to better understand layer motion. Two laboratory small-scale ponds and a large-scale outdoor solar pond were designed and built to provide quantitative data. This data provided a basis for validating the model and enhancing the understanding of pond dynamic behavior. B.G.

N85-14289*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
REVIEW OF SERI SOLAR POND WORK
F. Zangrando and D. H. Johnson *In* JPL Salt-Gradient Solar Ponds Aug. 1984 12 p refs Prepared in cooperation with Los Alamos National Lab. (For primary document see N85-14286 05-44)
Avail: NTIS HC A08/MF A01 CSCL 10A

Development of models of pond thermal performance; analysis of solar pond use for building space heat and hot water production; use of low-temperature pond-produced heat for industrial processes, desalination, and electricity production; development of direct-contact heat exchanger to reduce conversion equipment cost; determination of effects of extracted heat and mass from the storage layer on pond performance; and investigation of factors which determine gradient layer stability and the stability of this interface between this level and the upper and lower convecting layers were described. B.G.

N85-14290*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SALTON SEA SOLAR POND POWER PLANT DESIGN STUDY AND REGIONAL APPLICABILITY
R. L. French *In its* Salt-Gradient Solar Ponds Aug. 1984 30 p refs (For primary document see N85-14286 05-44)
Avail: NTIS HC A08/MF A01 CSCL 10A

Ormat collected and organized the data base and conducted conceptual plant design, performance, and cost analysis. JPL conducted site-specific studies related to solar pond chemistry, soil biological activity, and dike design and construction. WESTEC conducted environmental investigation studies and performed an environmental assessment. SCE provided planning support for licensing and permitting and technical evaluations of the system design and cost estimate. B.G.

N85-14291*# Argonne National Lab., Ill.
SOLAR POND RESEARCH AT ARGONNE NATIONAL LABORATORY
John R. Hull *In* JPL Salt-Gradient Solar Ponds Aug. 1984 6 p refs (For primary document see N85-14286 05-44)
Avail: NTIS HC A08/MF A01 CSCL 10A

Focus is on applications that utilize the seasonal heat-storage capability of the solar pond for low-temperature thermal processes, however the results of the research are directly applicable to electricity-generating and other applications. Important technical results are summarized. B.G.

N85-14292*# Utah State Univ., Logan. Water Research Lab.
SUMMARY OF SALT GRADIENT SOLAR POND RESEARCH
J. Clair Batty and J. Paul Riley *In* JPL Salt-Gradient Solar Ponds Aug. 1984 22 p (For primary document see N85-14286 05-44)
Avail: NTIS HC A08/MF A01 CSCL 10A

Abstracts and summaries of 18 different studies of various aspects of solar pond design and operation are included. B.G.

N85-14293# Kernforschungsanlage, Juelich (West Germany). Projektleitung Energieforschung.
MEASUREMENT-TECHNICAL INVESTIGATIONS OF WIND ENERGY UNITS [MESSTECHNISCHE UNTERSUCHUNGEN AN WINDENERGIEANLAGEN]
Feb. 1984 241 p refs In GERMAN Presented at Bundesmin. fuer Forschung und Technol. Seminar on Rahmen u. Programmes Energieforsch. u. -Technol., Bonn, 4-5 Apr. 1984 Sponsored by Bundesministerium fuer Forschung und Technologie
(JUEL-Spez-244; ISSN-0343-7639) Avail: NTIS HC A11/MF A01

Investigations of wind energy units using short-time spectral analysis, and measurement problems in investigation of wind-powered units are discussed. Measuring system and data evaluation method of the wind energy test field at Pellworm, and measuring methods to determine the static and dynamic behavior of wind energy converters are explained. A measurement data acquisition and processing system for wind rotor models in a wind channel is presented. The test results of the VOITH wind energy converter WEC 520, and the possibilities for measurements on windpower units using laser Doppler anemometers are given. The investigation of wind energy units from the control-technical, electrical, and energetic points of view is discussed. Measuring techniques in the GROWIAN program, measuring and control tasks

in OPTIWA, and an upwind power plant are presented. For individual titles, see N85-14294 through N85-14305.

N85-14294# Gesamthochschule, Kassel (West Germany). Fachbereich Elektrotechnik.
MEASUREMENT-TECHNICAL INVESTIGATIONS OF WIND ENERGY UNITS IN THE SHORT-TIME RANGE [MESSTECHNISCHE UNTERSUNGEN VON WINDENERGIEANLAGEN IM KURZZEITBEREICH]
W. Kleinkauf *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 6-18 refs In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

Wind energy systems were investigated by short-time spectral analyses. The analyses make it possible to determine causes of power fluctuations, qualitatively and quantitatively. It is advisable to determine such power spectra as a quality label for wind energy systems. Spectrum analysis also allows investigation of the effect of several construction measures on a unit with a view to reduced power fluctuations in the short-time range. For data evaluation a fast computer with process-interface, or, preferably, a digital signal analyzer which is directly available in situ, can be used. Author (ESA)

N85-14295# Fachhochschule, Giessen (West Germany).
MEASUREMENT-TECHNICAL PROBLEMS IN THE INVESTIGATION OF WIND ENERGY UNITS [MESSTECHNISCHE PROBLEME BEI DER UNTERSUCHUNG VON WINDKRAFTANLAGEN]
Uwe Machens *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 19-32 refs In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

Problems in measurements on wind energy units are discussed. Knowledge of the wind energy at the site and of the power characteristics of the unit are required, but determination is difficult. Especially for smaller units, this effort has to be reasonable with respect to the total costs of the project. The measuring data are averaged over a more or less long period to reduce the number of data and hence the measuring effort. Therefore errors arise due to nonlinear power characteristics. These errors can influence the calculation of the yearly energy of a wind energy unit. The effect of the averaging time on the measurement results is discussed. A proposal for a standardized measuring method is given. Author (ESA)

N85-14296# GKSS-Forschungszentrum Geesthacht (West Germany).
MEASURING SYSTEM AND DATA EVALUATION METHODS OF THE TEST FIELD FOR WIND ENERGY UNITS AT PELLWORM [MESSYSTEM UND DATENAUSWERTEMETHODIK DES VERUCHSFELDES FUER WINDKRAFTANLAGEN PELLWORM]
S. Fries, G. Petersen, D. Borchers, H. T. Mengelkamp, and H. J. Tauffenbach *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 33-61 refs In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

Power, energy yield, efficiency, technical availability, and operation reliability in the North Sea coast environmental conditions of small windpowered units were tested. The data evaluation requirements for the measuring system are given. Measuring methods, data acquisition and data evaluation are explained. Operating experience with wind energy systems is described. Power characteristics, time series, and global efficiency are discussed. Author (ESA)

N85-14297# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Datentechnik.
MEASURING METHODS TO DETERMINE THE STATIC AND DYNAMIC BEHAVIOR OF WIND ENERGY CONVERTERS [MESSMETHODEN ZUR EMITTLUNGEN DES STATISCHEN UND DYAMISCHEN VERHALTENS VON WINDEGIEKONVERTERN]
K. Reiniger and W. Balzer *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 62-90 refs In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

A wind energy test field data acquisition system, wind energy converter instrumentation, measurement container, wind energy converter load control, and rotor blade measuring system are presented. Structure of the data acquisition, and raw data preparation are outlined. Data evaluation methods are presented: statistical methods, and application of Fourier transformations on wind energy converter oscillation measurements. Author (ESA)

N85-14298# Bremen Univ., (West Germany). Fachbereich Physik.
MEASUREMENT DATA ACQUISITION AND PROCESSING SYSTEM FOR WIND ROTOR MEASUREMENTS IN THE WIND CHANNEL OF BREMEN UNIVERSITY [DAS MESSDATENERFASSUNGS- UND -VERARBEITUNGSSYSTEM FUER WINDROTORMESSUNGEN IM WINDKANAL DER UNIVERSITAET BREMEM]
D. Bruns, L. Helms, and K. Simhan *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 91-112 ref In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

Measurement setup and data processing for wind rotor models in a wind channel are presented. Results show that the system meets requirements entirely. The system can be used by laymen without assistance after a short explanation. Author (ESA)

N85-14299# Voith (J. M.) G.m.b.H., Herdenhern (West Germany). Antriebstechnik.
VOITH: WIND ENERGY CONVERTER WEC 520 [VOITH-WINDENERGIEKONVERTER WEC 520]
Werner Spittler *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 113-122 In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

The VOITH WEC 520 wind energy converter conceived as a self-supporting electric generator for mains and island operation was tested. A microcomputer was installed for process control. The rotor blades of the two-blade rotor is equipped with a separate measuring system to determine their oscillation behavior. Wind velocity, wind direction, rotor blade angle, rotor speed, rotor power, control oil pump pressure, and control pressure for rotor blade change are permanently measured. Author (ESA)

N85-14300# Erlangen-Nuremberg Univ. (West Germany). Lehrstuhl fuer Stroemungsmechanik.
LASER DOPPLER ANEMOMETER (LDA) WIND VELOCITY MEASUREMENTS: POSSIBILITIES FOR MEASUREMENTS ON WINDPOWER UNITS [LDA-WINDGESCHWINDIGKEITSMESSUNGEN: EN FUER MESSUNGEN AN WINDKRAFTANLAGEN]
F. Durst *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 123-138 refs In GERMAN (For primary document see N85-14293 05-44)
Avail: NTIS HC A11/MF A01

The utilization of laser Doppler anemometers for wind velocity measurements over distances of several hundred meters is described. Systems which allow the measurement of wind fields make it possible to determine quantitatively the flow field of windpowered units. Author (ESA)

N85-14301# SMA-Regelsysteme G.m.b.H., Kassel (West Germany).
MEASURING-TECHNICAL INVESTIGATION OF WIND ENERGY UNITS FROM THE CONTROL-TECHNICAL, ELECTRICAL AND ENERGETIC POINT OF VIEW [MESSTECHNISCHE UNTERSUCHUNG VON WINDENERGIEANLAGEN AUS REGELUNGSTECHNISCHER, ELEKTRISCHER UND ENERGETISCHER SICHT]
G. Cramer and P. Drews *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 139-150 ref In GERMAN (For primary document see N85-14293 05-44)

Avail: NTIS HC A11/MF A01

Requirements for construction, size, and efficiency of measuring systems for wind energy units are discussed. In spite of the differing hard and software requirements, a measuring system suited for short term measurement during the commissioning phase as well as for long term measurements on windpowered units is characterized. The functional groups of this system are the uniformity of data preprocessing, and the evaluation computer with storage and graphical hard copy unit. For short term measurements the data are only stored during the measurement and processed afterwards; for long term measurements the intensive data preprocessing allows on-line evaluation and direct presentation of the results. Author (ESA)

N85-14302# SMA-Regelsysteme G.m.b.H., Kassel (West Germany).

EXISTING MEASURING SYSTEMS FOR WIND ENERGY UNITS [REALISIERTE MESSYSTEME FUER WINDENERGIEANLAGEN]

G. Cramer and P. Drews *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 151-171 In GERMAN (For primary document see N85-14293 05-44)

Avail: NTIS HC A11/MF A01

Measuring systems for windpowered units were developed and tested. Concept and efficiency of digital measuring systems are presented. Tests show that direct measurement data processing and presentation of the results are necessary for efficient measuring and uncomplicated execution of long term investigations. A measuring system has to fulfill the following requirements: possibility of parallel processing and presentation of results in tabular and graphical form, parallel to long term measurements on wind energy units; and the evaluation of short term measurements with high temporal resolution. Author (ESA)

N85-14303# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Aktiengesellschaft.

MEASURING TECHNIQUES IN THE MEASURING PROGRAM FOR THE WINDPOWERED UNIT GROWIAN [MESSTECHNIK IM MESSPROGRAMMAN DER WINDKRAFTANLAGE GROWIAN]

F. Koerber *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 172-191 In GERMAN (For primary document see N85-14293 05-44)

Avail: NTIS HC A11/MF A01

The measuring strategy in the GROWIAN program and the measuring systems are presented. Power, load, and behavior during operation were checked. The determining physical characteristics, mainly mechanical and electrical, are obtained with 200 measuring points; they are recorded and evaluated by a data processing system. Author (ESA)

N85-14304# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik.

MEASURING AND CONTROL TASKS IN OPTIWA [MESS- UND STEUERAUFGABEN IN OPTIWA]

M. Mueller and F. Hailer *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 192-205 In GERMAN (For primary document see N85-14293 05-44)

Avail: NTIS HC A11/MF A01

A computer controlled measuring and operational model for a horizontal axis wind energy converter was developed. The rotor hub allows the simulation and testing of construction, control, and drive concepts without constructional changes. Requirements for measuring and control techniques, purposes of the measurements and control, global concept of the electronics, instrumentation, and general software concept are described. Author (ESA)

N85-14305# Schlaich und Paetner Beratende Ingenieure im Bauwesen, Stuttgart (West Germany).

THE UPWIND POWER PLANT MANZANARES [DAS AUFWIND-KRAFTWERK MANZANARES]

W. Haaf and H. Lautenschlager *In* Kernforschungsanlage Meas.-Tech. Invest. of Wind Energy Units Feb. 1984 p 206-236 In GERMAN (For primary document see N85-14293 05-44)

Avail: NTIS HC A11/MF A01

A prototype 400 MWpk solar power plant was developed. Operational behavior was simulated with a computer model. The obtained powers exceed model values by 25%. Measurements provide hints for further efficiency-improving effects (up to 100% better than the model). Author (ESA)

N85-14306# Department of the Air Force, Washington, D.C.

SOLAR CELL COVERSLIDE EXTRACTION METHOD AND APPARATUS Patent Application

C. R. Velley, inventor (to Air Force) Filed 13 Jun. 1984 12 p (AD-D011275; US-Patent-Appl-SN-620212) Avail: NTIS HC A02/MF A01 CSCL 10/2

Apparatus is described for extracting a coverslide from a solar cell includes a receptacle defining a cavity in which a rack is disposed which mounts a plurality of partitions in spaced, side-by-side relationship. The partitions define a plurality of extraction chambers there between which are open at their opposite ends. A screen is disposed below and underlies the rack for retaining solar cell modules received within the chambers in upright standing positions therein. The cavity is almost filled with a liquid solvent capable of detaching the coverslide of each module from its solar cell. A stirring device disposed below the rack on the bottom of the cavity can be actuated to create flow of the solvent along a circulatory path upwardly through some of the chambers and downwardly through other of the chambers and generally parallel to a plane of attachment of the coverslide to the solar cell of each module in the chambers. Also, air is bubbled through the chambers so as to assist the solvent in detaching the coverslides from the solar cells. GRA

N85-14307# Governor's Energy Office, Tallahassee, Fla.

RENEWABLE ENERGY: ENERGY FROM AGRICULTURAL PRODUCTS

Jun. 1984 21 p refs

(TI84-901769; NP-4901769) Avail: NTIS HC A02/MF A01

Agricultural products, particularly sugarcane and corn, are currently meeting major energy needs in Florida. Recent figures indicate that about 10 percent of the gasoline sold in Florida is ethanol enriched. This gasohol contains a 10 percent mix of ethanol, which is generally produced from corn or sugarcane molasses. Sugarcane residues (bagasse) also supply most of the fuel to power Florida's large sugar processing industry. These products have the potential to play an expanded role in Florida's energy future. Neither ethanol nor methane appear able to compete in the free market for mass distribution at present, although studies indicate that genetic engineering and more efficient conversion processes may lower prices to cost effective levels. These fuels will be most cost effective in cases where waste products are utilized and the fuel is used close to the site of production. Wider applications will require either government incentives or genetic engineering of crops and improve efficiencies in conversion processes to lower costs. DOE

N85-14308# Oak Ridge National Lab., Tenn. Energy Div.

PASSIVE SOLAR/EARTH SHELTERED OFFICE/DORMITORY COOLING SEASON THERMAL PERFORMANCE

Jeff Christian 1984 18 p refs Presented at the Doing Better: Setting an Agenda for the Second Decade Conf., Santa Cruz, Calif., 14 Aug. 1984

(Contract DE-AC05-84OR-21400)

(DE84-016662; CONF-840819-1) Avail: NTIS HC A02/MF A01

Continuous detailed hourly thermal performance measurements were taken since February 1982 in and around an occupied, underground, 4000 ft(2) office/dormitory building at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. This building has a number of energy saving features which were analyzed relative to their performance in a southeastern US climate and with respect to overall commercial building performance. Cooling season performance is documented, as well as effects of earth constact, interior thermal mass, an economizer cycle and interface of an efficient building envelope with a central three-ton heat pump. The Joint Institute Dormitory obtains a cooling energy savings of

about 30% compared with an energy-efficient, above-grade structure and has the potential to save as much as 50%. The proper instllation of the overhand, interior thermal mass, massive supply duct system, and earth contact team up to prevent summertime overheating. From May through September, this building cost a total of $300 (at 5.7) cents/kWh) to cool and ventilate 24 hours per day. Besides thermal performance of the building envelope, extensive comfort data was taken illustrating that at least 90% of the occupants are comfortable all of the time according to the PMV measurements. DOE

N85-14309# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ELECTRON CHANNELING AND EBIC STUDIES OF POLY-CRYSTALLINE SILICON SHEETS
Y. S. Tsuo and R. J. Matson May 1984 7 p refs Presented at the 17th IEEE PV Spec. Conf., Orlando, Fla., 1-5 May 1984
(Contract DE-AC02-83CH-10093)
(DE84-004515; SERI/TP-211-2319; CONF-840561-25) Avail: NTIS HC A02/MF A01

Electron channeling and EBIC studies were performed on silicon sheets grown by the edge-supported pulling (ESP) and low-angle silicon sheet (LASS) process. The dominant grain structure of the ESP sheets was found to be long, narrow grains with surface normals oriented near [011]; grains with this structure tend to have better electronic quality than random grains. The twin-stabilized planar growth material of LASS sheets was also studied. This material, grown at 200 sq cm/min, is essentially single-crystal. DOE

N85-14310# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DOUBLY DIFFUSIVE LINEAR STABILITY WITH NONCONSTANT GRADIENTS
F. Zangrando and L. Bertram Jun. 1984 57 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013008; SERI/TR-252-2052) Avail: NTIS HC A04/MF A01

The effect of variable stratification on thelinear bifurcations of a doubly diffusive plane parallel layer are examined numerically by expanding in a Fourier series. Because the motivation is analysis of solar pond stability, a Prandtl number of 7 and ratio of diffusivities of 1/80 is used in the study, with (large) solute Rayleigh numbers (Rs) ranging from 10,000 to 10 to the 12th power. Stratification of solute is a cubic antisymmetric about midlayer; because temprature has a higher diffusivity, it is given a linear stratification. The numerical results approach Walton's perturbation solution at large Rs, but differ significantly at smaller Rs (10 to the 8th power). While both exchange of stabilities and overstable modes display n expected tendency to localize about the point of minimum solute gradient, the overstable modes behave in oder, nonintuitive, ways. Localization, if extreme enough, can even stabilize small sublayers of reversed salinity gradient. Above Rs = 10 to the 12th power, computations become prohibitively expensive as a continuous spectrum is approached. DOE

N85-14311# California Dept. of Transportation, Sacramento. Div. of Aeronautics.
WIND-POWERED ELECTRIC GENERATION RUNWAY LIGHTING SYSTEM DEMONSTRATION PROJECT Interim Final Technical Report, 15 Sep. 1981 - 15 Dec. 1983
D. Mesa Jan. 1984 58 p refs
(Contract DE-FG03-81SF-11611)
(DE84-014962; DOE/SF-11611/T1) Avail: NTIS HC A04/MF A01

The project is a small scale demonstration project to determine the feasibility of using wind-powered generation of electricity to operate the runway lighting system at Half Moon Bay Airport. The airport is located in San Mateo County south of San Francisco, California. This project seeks to determine if wind power has practical application to an airport environment as a cost-effective means of providing an alternate source of energy. Should the results of this demonstration be positive, the technology can be applied to airports statewide which possess the meteorological conditions conductive to wind power generation. Concurrently included in the demonstration project is the construction of a runway lighting system designed for low energy use. The total system is tied into PG and E's grid system. DOE

N85-14312# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
JOINT INDO-GERMAN PROGRAM ON SOLAR ENERGY: PARABOLIC DISH PROGRAM, STEP 1 Final Report, 1983
Freider Wolz Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 69 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-175; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,50

A 4 m diameter parabolic dish solar collector is described. A test loop including tracking system was built. It is shown that the technical concept and the applied technologies are suitable under Indian environmental conditions. Temperatures up to 350 C are reached. Author (ESA)

N85-13851*# California Univ., Livermore. Lawrence Livermore Lab.
ROTATING ASSEMBLY WORKING GROUP SUMMARY
Satish V. Kulkarni *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 7-24 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13852*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ELECTROMECHANICAL/ELECTROMAGNETICS WORKING GROUP SUMMARY
David B. Eisenhaure *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 25-28 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13853*# TRW Systems Group, Redondo Beach, Calif.
ELECTRICAL/ELECTRONICS WORKING GROUP SUMMARY
Arthur D. Schoenfeld *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 29-38 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13854*# Rockwell International Corp., Downey, Calif.
DYNAMICS AND CONTROLS WORKING GROUP SUMMARY
Ronald E. Oglevie *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 39-48 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13855*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SUMMARY OF THE 1983 INTEGRATED FLYWHEEL TECHNOLOGY WORKSHOP
Claude R. Keckler *In its* An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 49-64 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13856*# European Space Agency, Paris (France).
EUROPEAN DEVELOPMENT EXPERIENCE ON ENERGY STORAGE WHEELS FOR SPACE
A. A. Robinson *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 65-73 ref (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13858*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMPARATIVE ENERGY STORAGE ASSESSMENT ITEM
Bob Giudici *In* NASA. Langley Research Center An Assessment

of Integrated Flywheel System Technol. Nov. 1984 p 91-99 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13861*# Wisconsin Univ., Madison. Dept. of Medical Physics.
FLYWHEEL-POWERED X-RAY GENERATOR
Melvin P. Siedband *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 129-139 refs (For primary document see N85-13850 05-20) (Contract DAMD17-82-C-2050)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13862*# Westinghouse Research and Development Center, Pittsburgh, Pa.
WESTINGHOUSE PROGRAMS IN PULSED HOMOPOLAR POWER SUPPLIES
D. C. Litz and E. Mullan *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 141-156 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13865*# Oak Ridge National Lab., Tenn.
SUMMARY RESULTS OF THE DOE FLYWHEEL DEVELOPMENT EFFORT
M. Olszewski and J. F. Martin *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 181-191 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13868*# Rocketdyne, Canoga Park, Calif.
THE MULTIPURPOSE COMPOSITE FLYWHEEL
B. R. Ginsburg *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 233-242 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13870*# Sperry Flight Systems, Phoenix, Ariz.
MAGNETICALLY SUSPENDED REACTION WHEEL ASSEMBLY
George Stocking *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 265-279 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13874*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REACTION WHEELS FOR KINETIC ENERGY STORAGE
Philip A. Studer *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 329-340 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13875*# Sperry Flight Systems, Phoenix, Ariz.
ADVANCED HIGH-POWER TRANSFER THROUGH ROTARY INTERFACES
Pete Jacobson *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 341-348 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13876*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
HIGH-EFFICIENCY POWER CONVERSION OPTIONS FOR FLYWHEEL ENERGY STORAGE SYSTEMS
R. L. Hockney *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 349-367 refs (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13879*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TORQUE COMMAND STEERING LAW FOR DOUBLE-GIMBALED CONTROL MOMENT GYROS APPLIED TO ROTOR ENERGY STORAGE
Hans F. Kennel *In* NASA. Langley Research Center An Assessment of Integrated Flywheel System Technol. Nov. 1984 p 407-422 (For primary document see N85-13850 05-20)
Avail: NTIS HC A18/MF A01 CSCL 10B

N85-13888*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRENDS IN SPACE PHOTOVOLTAIC TECHNOLOGY
John A. Scott-Monck *In* NASA. Lewis Research Center Space Power Apr. 1984 p 85-93 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

N85-13890*# Boeing Aerospace Co., Seattle, Wash.
POTENTIAL OF FLYWHEELS FOR SPACECRAFT ENERGY STORAGE
Sidney Gross *In* NASA. Lewis Research Center Space Power Apr. 1984 p 101-113 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10C

N85-13891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRENDS IN CONCENTRATOR, RECEIVER, AND STORAGE DEVELOPMENT FOR TERRESTRIAL APPLICATIONS
E. John Roschke, William A. Owen, Wesley A. Menard, and Toshio Fujita *In* NASA. Lewis Research Center Space Power Apr. 1984 p 115-135 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

N85-13892*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC POWER SYSTEMS FOR POWER GENERATION
Robert E. English *In its* Space Power Apr. 1984 p 137-149 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

N85-13894*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH TEMPERATURE THERMOELECTRIC ENERGY CONVERSION
Charles Wood *In* NASA. Lewis Research Center Space Power Apr. 1984 p 171-187 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

N85-13902*# Lockheed Missiles and Space Co., Palo Alto, Calif.
PHOTOVOLTAIC WORKING GROUP REPORT
Larry G. Chidester and Joseph F. Wise (Wright-Patterson AFB, Ohio) *In* NASA. Lewis Research Center Space Power Apr. 1984 p 285-291 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 10B

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-14313# Brookhaven National Lab., Upton, N. Y. Environmental Chemistry Div.
THE USE OF TRACERS FOR THE STUDY OF ATMOSPHERIC CHEMICAL AND PHYSICAL TRANSFORMATION PROCESSES
Stephen E. Schwartz 1984 45 p refs Presented at the Workshop on Atmospheric Tracers, Santa Fe, N. Mex., 21-25 May 1984 (Contract DE-AC02-76CH-00016)
(DE84-015287; BNL-35038; CONF-8405224-1) Avail: NTIS HC A03/MF A01

The occurrence of transformations in the ambient atmosphere and/or to measure the rates of transformation processes was observed. Changes in concentrations of species of interest as a function of time were noted, but in all cases this translates into a need to observe concentrations as a function of position, the

conversion between these two variables being the transport wind velocity. Concentration changes resulting from processes other than chemical or physical transformation can interfere with the interpretation of transformation processes. Potential sources of error include inaccuracy in following an air parcel (especially in the presence of a concentration gradient), concentration changes resulting from dilution, and/or failure of an underlying steady state assumption. The use of tracer compounds as a means of avoiding such errors is examined. Applications of conservative tracers include use as a Lagrangian marker and/or as a concentration standard. Applications of reactive tracer compounds to the study of atmospheric transformations are considered. Several types of application are presented. DOE

N85-14314# Rockwell International Corp., Golden, Colo. Energy Systems Group.
HS AND E ENVIRONMENTAL SCIENCES Semiannual Progress Report, Jan. - Jul. 1982
Douglas C. Hunt, George W. Campbell, C. A. Deitesfeld, ed., and L. M. Morales, comp. 25 Jun. 1984 47 p refs
(Contract DE-AC04-76DP-03533)
(DE84-016183; RFP-3650) Avail: NTIS HC A03/MF A01

Research and evaluation activities for the Environmental Sciences Branch are summarized. Progress in five primary areas of effort is reported: (1) dust transport; (2) environmental health; (3) quality assurance of measurement techniques; (4) beryllium levels in regional soils; and (5) evaluation of actual and hypothetical Plantsite incidents. Progress is also described in programs dealing with plant land management, distribution of transuranium (TRU) elements in sediments, and alpha emitter composition of Plantsite pond waters. DOE

N85-14315# Pacific Northwest Lab., Richland, Wash.
MEAN MAXIMUM MIXING HEIGHTS FOR NORTHERN ASIA FOR THE WINTER OF 1978
W. E. Davis and P. E. Tucker Aug. 1984 21 p refs
(Contract DE-AC06-76RL-01830)
(DE84-015980; PNL-5198) Avail: NTIS HC A02/MF A01

Mean maximum mixing heights are used to compute the vertical extent of mixing of an air pollutant released in the surface boundary layer. A past study by Holzworth (1972) examined mean maximum mixing heights in the United States. This study was confined to northeastern Asia and presents the results of computing maximum mixing heights over a single winter. Also included are mean layer averaged wind speeds for the same time period. Two regions of low maximum mixing heights and low mean wind speeds were noted. DOE

N85-14316# Argonne National Lab., Ill.
PORTABLE INSTRUMENT FOR THE DETECTION AND IDENTIFICATION OF AIR POLLUTANTS
J. R. Stetter, S. Zaromb, W. R. Penrose, T. Otagawa, J. Sinclair (Coast Guard, Washington, D.C.), and J. Stull (Coast Guard, Washington, D.C.) 1984 9 p refs Presented at the 4th Ann. Natl. Symp. on Recent Advances in the Measurement of Pollutants, Raleigh, N.C., 8 May 1984
(Contract W-31-109-eng-38)
(DE84-014767; CONF-8405213-1) Avail: NTIS HC A02/MF A01

The instrument comprises four electrochemical sensors that respond to toxic gases and two heated noble metal filaments that cause many compounds to be partially pyrolyzed or oxidized in air. The sensors can be rapidly switched to one of several operating modes providing 16 independent data channels. The instrument fits into a camera case, weighs 15 pounds, and can operate for at least 4 hours on self contained rechargeable batteries. When monitoring the presence of any unknown contaminant, the sensor array is connected to the sampling probe and signals the presence of a possibly hazardous species. A sample is then collected, passed through the sensor array and the relative magnitudes of the response signals provide the information needed to identify the sample. DOE

N85-14317# California Univ., Livermore. Lawrence Livermore Lab.
ASPECTS OF THE COMPARISON OF STRATOSPHERIC TRACE SPECIES MEASUREMENTS WITH PHOTOCHEMICAL MODELS
P. S. Connell and D. J. Wuebbles Aug. 1984 7 p refs Presented at Quadrennial Ozone Symp., Halkidki, Greece, 3 Sep. 1984
(Contract W-7405-eng-48)
(DE84-017028; UCRL-90297; CONF-8409122-2) Avail: NTIS HC A02/MF A01

Observation and measurement of reservoir species, including H2O2, ClONO2, NO4, HOCl, N2O5 and others which can test some portions of photochemical models of the stratosphere, leading to improvements and increased confidence in model predictions are discussed. But abundance measurements of a single reservoir species without accompanying values for other species do not serve to constrain the related model mechanism and parameters within the recognized uncertainties. This follows from the sensitivity of abundance of a species to fluctuations in its long lived precursors from transport processes. Correlation studies in which precursor concentrations and photolytic fluxes are measured simultaneously and in the same air volume as the reservoir species are outlined. Three differing observations of upper limits for H2O2 give an example of the difficulties. All three reported values could be nearly consistent with the current LLNL one dimensional stratospheric photochemical model, depending on the values of O3, NO/sub x/ and H2O appropriate to each measurement. The important precursors in each is identified by consideration of the appropriate kinetics and observed precursor variability. DOE

N85-14318# Oak Ridge National Lab., Tenn.
ACID RAIN AND TREE PHYSIOLOGY: SOME HYPOTHESES FOR OBSERVED CHANGES IN FOREST PRODUCTIVITY
S. B. McLaughlin 1983 60 p refs Presented at US/Canadian Conf. on Forest Responses to Acidic Imposition, Orono, Maine, 3 Aug. 1983
(Contract DE-AC05-84OR-21400)
(DE84-016568; CONF-8308115-3) Avail: NTIS HC A04/MF A01

The experimental evidence for several principal physiological pathways of influence of acid rain and associated pollutants on forest growth processes was examined. This was accomplished by examining experimental evidence from a variety of sources which suggest likely mechanisms of response. The following mechanisms were examined: (1) altered plant-water relations, (2) altered availability of nutrients, (3) direct effects on growth and physiological processes, and (4) indirect effects on resistance to biotic and abiotic stresses. Some characteristics of recent forest declines were examined to evalutate consistencies of response patterns with physiological mechanisms. DOE

N85-14319# GKSS-Forschungszentrum Geesthacht (West Germany).
MEASUREMENTS ON THE DIFFUSION OF HYDROGEN CHLORIDE IN THE WASTE GAS PLUME OF INCINERATION SHIPS IN THE NORTH SEA. PART 1: METHODOLOGY, INSTRUMENTATION AND PRESENTATION OF DATA [MESSUNGEN AUF DER NORDSEE ZUR AUSBREITUNG VON CHLORWASSERSTOFF IN ABGASFAHNEN VON VERBRENNUNGSSCHIFFEN. I. METEOROLOGISCHER TEIL - INSTRUMENTATARIUM UND DATENBERICHT]
H.-T. Mengelkamp, H. Lohse, and U. Apel 25 May 1984 97 p refs In GERMAN; ENGLISH summary
(GKSS-84/E/23-Pt-1; ISSN-0344-9629) Avail: NTIS HC A05/MF A01

The distribution of hydrogen chloride in the waste gas plume of incineration ships burning chlorinated hydrocarbon waste in the North Sea was investigated. The meteorological parameters for the propagation were continuously measured near the surface. Radiosondes and wire sondes were used for vertical profiling in the atmospheric boundary layer. Author (ESA)

N85-14320# Woods Hole Oceanographic Institution, Mass.
[ACTIVITIES OF THE COASTAL RESEARCH CENTER] Technical Report, Jan. 1982 - Apr. 1984

Bruce W. Tripp, ed. May 1984 52 p refs Sponsored in cooperation with Andrew W. Mellon Foundation, Charles E. Culpeper Foundation, Inc., Mobil Foundation, Inc., and Kresge Foundation
(PB84-231323; WHOI-84/22; CRC-84/4) Avail: NTIS HC A04/MF A01 CSCL 13B

The Coastal Research Center of the Woods Hole Oceanographic Institution conducts research which contributes to an ever expanding base of knowledge and improved understanding of the coastal ocean, its physics, chemistry, biology and geology. This improved understanding will provide a basis for management of coastal resources. GRA

N85-14321# Environmental Protection Agency, Seattle, Wash.
CARBON MONOXIDE STUDY, ANCHORAGE, ALASKA, NOVEMBER 22, 1982 TO FEBRUARY 11, 1983
Jon W. Schweiss, George LaMore (Anchorage Air Pollution Control Authority), and Thomas Chapple (Alaska Dept. of Environmental Conservation) Nov. 1983 67 p
(PB84-236595; EPA-910/9-83-110) Avail: NTIS HC A04/MF A01 CSCL 07D

Levels of ambient carbon monoxide (CO) vary widely among the four existing permanent monitoring sites distributed throughout the city of Anchorage. An ambient air sampling program was implemented to clarify and define the relationship of carbon monoxide levels reported from these permanent sites and levels occurring elsewhere in the city. Integrated bag sampling was conducted on weekdays at approximately 50 sites. Samples collected from each site were analyzed by the nondispersive infrared (NDIR) method. Comparisons were then made between data from the study sites and the four permanent monitoring sites. A quality assurance program was developed to ensure the collection of data that were of known and appropriate accuracy, precision, representativeness, comparability and completeness. It was found that: (1) the permanent monitoring network does not adequately characterize either the absolute magnitude of CO levels or the frequency of standards exceedances encountered at an array of locations elsewhere in the study area; and (2) the basic or immediate representatives of each permanent monitoring site is largely established. GRA

N85-14187*# Duke Univ., Durham, N. C.
CARBON CYCLE: TERRESTRIAL INTERACTIONS
W. H. Schlesinger *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 85-96 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01

N85-14192*# Stanford Univ., Calif. Dept. of Biological Sciences.
TERRESTRIAL NITROGEN CYCLES: SOME UNANSWERED QUESTIONS
P. Vitousek *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 209-218 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 13B

N85-14194*# Oak Ridge National Lab., Tenn.
MODELING LONG-TERM CHANGES IN FORESTED LANDSCAPES AND THEIR RELATION TO THE EARTH'S ENERGY BALANCE
H. H. Shugart, W. R. Emanuel, and A. M. Solomon *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 229-252 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 02F

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-14322 California Inst. of Tech., Pasadena.
PETROLOGY AND PETROGENESIS OF BATHOLITIC ROCKS, SAN JACINTO MOUNTAINS, SOUTHERN CALIFORNIA
Robert Ian Hill 1984 731 p
Avail: Univ. Microfilms Order No. DA8420810

Three major, and many minor masses of Cretaceous batholithic rock crop out in the San Jacinto Mountains of southern California. Contacts between units are offset up to 6 km by faults of the Neogene San Jacinto fault system, which as a total right-lateral displacement of 29 + or - 1 km. Isotope data show that melt production, transport and crystallization processes combined were not capable of completely homogenizing the heterogeneous liquids from which these rocks crystallized. The combined observations are compatible with crystallization from an intermittently recharged, continuously fractionating system. Recharge tended to buffer both the thermal and chemical properties of liquids within the magma chamber; it also gave a mechanism for introducing isotopic variations into this continuously crystallizing system. The combined Sr-O isotope data require incorporation of material from three distinct source materials, most probably depleted mantle or oceanic crust (40 to 75%), subducted sediment (20 to 25%) and old continental lithosphere (0 to 35%). Dissert. Abstr.

N85-14323 Stanford Univ., Calif.
A TECTONIC AND METAMORPHIC HISTORY OF THE NORTH-CENTRAL KLAMATH MOUNTAINS, CALIFORNIA
Lawson Bruce Hill 1984 282 p
Avail: Univ. Microfilms Order No. DA8420550

An important interval of orogenic activity between 172 and 150 million years (my.) ago is responsible for the assembly, metamorphism and deformation of four terranes in the north central Klamath Mountains. From petrologic, structural and geochronological data it is apparent that in an early pulse of tectonism, between 162 and 172 my. ago, the Hayford and Marble Mountains terranes were juxtaposed along a low angle thrust. The Condrey Mountain terrane then underthrust the base of the Marble Mountains sometime after 162 m. Later accretion of the Smith River terrane to the three terrane assemblage occurred at about 150 my. Observed deformational fabrics support three major episodes of regional folding. Early but unrelated isoclinal folding events are associated with prograde metamorphism in the Marble Mountains and Condrey Mountain terranes. A second stage isoclinal folding affected the Hayford terrane as well as the Condrey Mountain and Marble Mountains terranes. A third folding event is associated with accretion of the Smith River terrane, and overprints all contacts and reexisting structural fabrics. Dissert. Abstr.

N85-14324 Pennsylvania State Univ., University Park.
TECTONIC HISTORY OF A CONTINENT: ISLAND ARC BOUNDARY, WEST-CENTRAL IDAHO
Karen Lund 1984 242 p
Avail: Univ. Microfilms Order No. DA8419631

The tectonic framework of west central Idaho is set by the juxtaposition of the North American continental and allochthonous oceanic terranes. The eastern (North American) terrane is composed of quartzite, conglomerate, marble, and schist of upper greenschist and lower amphibolite metamorphic grade. These metasediments contain sedimentary structures and are more prevalent and stratigraphically continuous than was supposed. They are divided into four tectonostratigraphic units that have different stratigraphic and structural development. These are subdivided into lithologic groups. No fossils were found, but based on facies changes, sedimentary features, and lithologies, they probably represent sediments from Proterozoic Y to Paleozoic ages. Parellel bedding, primary schistosity, and metamorphic compositional layering were deformed by: folding and thrusting that formed duplexes, folding related to decollement, thrust stacking of previously deformed plates, and gentle folds superposed across several plates. All structural vergence in this terrane represents west over east movement. Dissert. Abstr.

N85-14325 Stanford Univ., Calif.
PETROLOGY AND STRUCTURE OF PWEMAIN TO JURASSIC

ROCKS NEAR YREKA, KLAMATH MOUNTAINS, CALIFORNIA
Nicholas Mortimer 1984 113 p
Avail: Univ. Microfilms Order No. DA8420594

Rocks of the western Paleozoic and Triasic Belt (TrPz belt) of Irwin (1966) in the north eastern Klamath Mountains of California can be subdivided into the same lithotectonic units (terranes) recognized in the southern and central Klamath Mountains. In descending structural order, these are the Fort Jones, North Fork, Salmon River, Havfork and Marble Mountains terranes of Blake and others (1982). Stratigraphic and petrologic regions are consistent with the North Fork, Salmon River and eastern Hayford terranes evolved in close proximity to each other since their origin in Permian time. Faunal and sedimentological evidence suggest that the North Fork terrane was probably at least hundreds of kilometers distant from North America in Permian time, but was close to the continent by early Jurassic time. The structural and metamorphic history of the terranes is consistent with assembly of the TrPz belt in a single, evolving middle and late Jurassic arc/subduction system. Dissert. Abstr.

N85-14326 Pittsburgh Univ., Pa.
MULTIVARIATE ANALYSES OF SEDIMENTOLOGICAL DATA AT TWO EARLY BRONZE AGE SITES, BAB EDH-DHRA AND NUMEIRA, SOUTHEAST DEAD SEA GRABEN, JORDAN
Olufemi Olaniyan 1984 281 p
Avail: Univ. Microfilms Order No. DA8421314

Sedimentation at two Early Bronze Age sites of Bab edh Dhra and Numeira, located on alluvial terraces east of the Dead Sea graben in Jordan were studied. The analyzed sediment samples include the Lisan Marl (crops out only at Bab edh Dhra), clay, sand, gravels, mud brick, plaster, ash, puddling, slope wash (sampled only at Bab edh Dhra), and soil. Characterization of the sediments of these two archeological sites was possible following textural, mineralogical, and chemical analyses of 334 sediment samples. The sediment facies possess unique characteristics that allow their identification. The location and topography, bedrock geology, and occupational history at the two sites are the causes of the differences in the characteristics of their sediment piles. Bab edh Dhra sediments are finer grained, better sorted, and more finely skewed than those at Numeira. At the latter, they contain more quartz and less calcium carbonate while there is more calcite, aragonite and calcium carbonate at the former. Dissert. Abstr.

N85-14327 Washington Univ., St. Louis, Mo.
GEOLOGY, PETROLOGY, AND TECTONIC SETTING OF THE MAFIC ROCKS OF THE 1480 MA OLD GRANITE-RHYOLITE TERRANE OF MISSOURI, USA
Paul Joseph Sylvester 1984 614 p
Avail: Univ. Microfilms Order No. DA8418761

Igneous and metamorphic mafic rocks form a volumetrically subordinate component of the 1480 Ma old granite rhyolite terrain of Missouri. The igneous rocks are present in the St. Francois Mountains and a drillcore from Shannon county and can be subdivided into two groups. The Silver Mines Mafic Group exhibits some calc-alkaline chemical affinities that may be the result of crustal contamination by a source with a bulk intermediate to felsic composition. The contaminant probably is not the exposed granites or rhyolites of the St. Francois Mountains. The 1500 to 1400 Ma old belt probably formed in an extensional tectonic setting. The Basin and Range province of the western United States may be the most similar modern analogue. Between 1400 to 1200 Ma ago, an incipient continental rift may have formed along the axis of the 1500 to 1400 Ma old magmatic belt. Mafic magma emplaced during the rifting event possibly included the Skrainka Mafic Group of Missouri, the Harp dikes and Seal Lake Group of Labrador, and some of the Gardar rocks of southwest Greenland. Dissert. Abstr.

N85-14328 Wyoming Univ., Laramie.
GEOPHYSICAL INVESTIGATION OF PRECAMBRIAN CRUSTAL STRUCTURE AND LARAMIDE EFFECTS ACROSS A PRECAMBRIAN SUTURE IN SOUTHEASTERN WYOMING
Roy Johnson 1984 182 p
Avail: Univ. Microfilms Order No. DA8418779

Studies of a regional geologic, geochronologic and geophysical discontinuity in southeastern Wyoming known as the Cheyenne Belt show this boundary to be a major crustal suture separating the Archean Wyoming Province from southern Proterozoic terrains. Precambrian rocks exposed in Laramide uplifts may be separated from structures at greater depths by Laramide faults, but analysis of COCORP seismic reflection data across the Laramie Mountains constrains the dip of the frontal fault zone to about 30-35 W. Stratigraphic separation at the fault front is about 1200 m. Faults buried beneath Tertiary rocks east of the mountain front contribute to uplift of the range, but Precambrian structures displayed on seismic data can be considered to be rooted if the scale of the structures is substantially larger than 1200 m. The gravity field associated with the Cheyenne Belt is not a Laramide feature which suggests that proximal differences in crustal structure and thickness can persist for almost 2 billion years. Dissert. Abstr.

N85-14329 Saint Louis Univ., Mo.
A COMPUTATIONAL STUDY OF TWO POSSIBLE INTRAPLATE EARTHQUAKE TRIGGERING MECHANISMS
James Joseph Kohsmann 1984 348 p
Avail: Univ. Microfilms Order No. DA8418658

The efficacy of two potential mechanisms for either triggering or causing seismicity is examined. The conclusions are specifically applied to the seismology of the New Madrid seismic zone, where they are found to have no demonstrable effect. The effect of water loading in the Mississippi River is examined first. The modeling of a river load by a finite length of rectangular load approximations results in a nonunique determination of the stress distribution which is dependent on the load geometry far outside of the region of interest. A statistical study of the relation between seismicity, river stage, and their tendency functions for 1976 in the northern Mississippi Embayment is also presented. As a prelude to the investigation of thermal stresses related to cylindrical plutonic intrusions, a detailed computational study of the thermal effects of such intrusions is also presented. The computational study of the thermal stresses associated with cylindrical plutonic intrusions is done. The results are discussed in relation to the seismicity and tectonic environment of the northern Mississippi Embayment. Dissert. Abstr.

N85-14330 Saint Louis Univ., Mo.
A DIAGNOSTIC APPROACH TO OBTAINING PLANETARY BOUNDARY LAYER WINDS USING SATELLITE-DERIVED THERMAL DATA Ph.D. Thesis
Carol Lynn Belt 1984 176 p
Avail: Univ. Microfilms Order No. DA8418611

The feasibility of using satellite-derived thermal data to generate realistic synoptic-scale winds within the planetary boundary layer (PBL) is examined. Diagnostic modified Ekman wind equations from the Air Force Global Weather Central (AFGWC) Boundary Layer Model are used to compute winds at seven levels within the PBL transition layer (50 m to 1600 m AGL). Satellite-derived winds based on 62 predawn TIROS-N soundings are compared to similarly-derived wind fields based on 39 AVE-SESAME II rawinsonde (RAOB) soundings taken 2 h later. Actual wind fields are also used as a basis for comparison. Qualitative and statistical comparisons show that the Ekman winds from both sources are in very close agreement, with an average vector correlation coefficient of 0.815. Best results are obtained at 300 m AGL. Satellite winds tend to be slightly weaker than their RAOB counterparts and exhibit a greater degree of cross-isobaric flow. The modified Ekman winds show a significant improvement over geostrophic values at levels nearest the surface. Horizontal moisture divergence, moisture advection, velocity divergence and relative vorticity are computed at 300 m AGL using satellite-derived winds and moisture data. Dissert. Abstr.

N85-14331 Portland State Univ., Oreg.
DETERMINATION OF TOLUENE'S DEGRADATION PRODUCTS UNDER SIMULATED ATMOSPHERIC CONDITIONS

Ph.D. Thesis
Bruce Eugene Dumdei 1984 158 p
Avail: Univ. Microfilms Order No. DA8420067

The toluene oxidation process was studied by blacklight irradiation of 1-10ppm each of toluene and oxides of nitrogen in 22-liter pyrex flasks, in zero-air at 50% relative humidity. The products were recovered from the walls by extraction with methanol or dichloromethane. Some gas-phase products were recovered in the solvent as well. The extracts were analyzed on a Finnigan MAT triple stage quadrupole mass spectrometer/data system by direct probe injection. Once their molecular weights were determined, the products were fragmented by collision-dissociation (CID) in the middle quadrupole to produce characteristic daughter ions. To assist in the spectral interpretation, toluene in three isomeric forms was subjected to simulated atmospheric reaction. In addition to normal (H8) toluene, methyl-deuterated (D3) and per-deuterated (D8) toluene were used. This study confirmed the existence of a number of products identified in past studies, confirmed the formation of some products which have been hypothesized in several proposed mechanisms for toluene oxidation, identified a number of previously unidentified and unproposed products.
Dissert. Abstr.

N85-14332*# Denver Univ., Colo. Dept. of Physics.
UTILIZATION OF SAGE AEROSOL PROFILES IN THE ANALYSIS OF MAUNA LOA STRATOSPHERIC LIDAR DATA Final Report, 1 Jul. 1983 - 30 Jun. 1984
Frederick G. Fernald and David G. Murcray Oct. 1984 24 p refs
(Grant NAGw-479)
(NASA-CR-174198; NAS 1.26:174198) Avail: NTIS HC A02/MF A01 CSCL 04A

A systematic approach to analyzing lidar data collected at NOAA's Mauna Loa Observatory (MLO) was developed which relies on parameters derived from SAGE satellite extinction profile measurements to verify boundary conditions applied to analysis. The approach also provides a means of assessing the uncertainties associated with the various inputs, so that the accuracy of the analysis of the MLO lidar data is available. The stratosphere during the 1980 to 1981 period was only mildly perturbed and could be easily represented by the SAMII/SAGE background aerosol model. The MLO lidar observations collected during this period provided stratospheric optical depths with uncertainties ranging between 15% and 25%. Uncertainties in the aerosol optical model contribute errors of 3% to 4% in the computed optical depths. Most of the optical depth uncertainty is associated with the calibration assumption in which no marked improvement can be expected.
A.R.H.

N85-14333# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BEHAVIOR OF THE IONOSPHERIC F REGION IN LOW LATITUDES AND IN THE EQUATORIAL REGION OF BRAZIL DURING STRONG MAGNETIC STORMS IN THE 1978 TO 1983 PERIOD [COMPORTAMENTO DA REGIAO IONOSFERICA F EM BAIXAS LATITUDES E REGIAO EQUATORIAL DO BRASIL DURANTE FORTES TEMPESTADES MAGNETICAS, NO PERIODO 1978 - 1983]
E. R. dePaula and M. A. Abdu Aug. 1984 19 p refs In PORTUGUESE; ENGLISH summary
(INPE-3231-PRE/581) Avail: NTIS HC A02/MF A01

The ionospheric F-region response to the magnetic storms of strong intensity that occurred in the 1978 to 1983 period in the law latitudes and in the equatorial region over Brazil was analyzed using ionosonde data and the VHF polarimeter. Generally, the F-region electron density peak, obtained by ionosondes, and the total electron content (TEC) obtained by the polarimeter show an increase relative to the average values of the magnetically calm periods, during the main phase of the storms. Well-defined decreases in the electron density were observed during the recovery phase of the storms. A characteristic observed in the TEC variation, mainly in the equinoctial months, is a pronounced increase during the premidnight hours, that is less prominent during magnetic storms. It was observed that increases in the TEC and in the F-region electron density peak are in phase, in the majority of the cases, during the night and the morning hours. R.S.F.

N85-14334# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NOCTURNAL INCREASES OF IONIZATION IN THE IONOSPHERIC F REGION IN THE LOW LATITUDE OF BRAZIL DURING MAGNETIC STORMS [AUMENTOS NOTURNOS NA IONIZACAO DA REGIAO IONOSFERICA F EM BAIXA LATITUDE NO BRASIL DURANTE TEMPESTADES MAGNETICAS]
E. R. dePaula, Y. Sahai, M. A. Abdu, and N. R. Teixeira Sep. 1984 17 p refs In PORTUGUESE; ENGLISH summary
(INPE-3271-PRE/596) Avail: NTIS HC A02/MF A01

During recent years, ionospheric F-region observations over Brazilian low latitude have been realized using VHF polarimeters, ionosondes and photometers. Simultaneous observations of these ionospheric sounders are used to study the F-region behavior during magnetic storms. Large enhancements in the total electron content (TEC), in the peak electron density, and in the airglows emissions were observed during many moderate and strong magnetic storms. Prominent features of these observations and possible mechanisms responsible for these enhancements are discussed. Author

N85-14335# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MEASUREMENTS OF ELECTRIC FIELDS OBTAINED BY STRATOSPHERIC BALLOONS IN THE REGION OF THE SOUTH ATLANTIC ANOMALY [MEDIDAD DE CAMPOS ELETRICOS ATRAVES DE BALOES ESTRATOSFERICOS NA REGIAO DA ANOMALIA DO ATLANTICO SUL]
I. R. C. de A. Pinto, A. L. C. Gonzalez, W. D. Gonzalez, O. Pinto, Jr., and S. L. G. Dutra Aug. 1984 12 p refs In PORTUGUESE; ENGLISH summary
(INPE-3218-PRE/571) Avail: NTIS HC A02/MF A01

Measured values for the atmospheric electric fields are presented. The data were obtained in 1981 with a double probe balloon-borne detector. R.S.F.

N85-14336*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ASSESSMENT OF TECHNIQUES FOR MEASURING TROPOSPHERIC H SUB x O SUB y
James M. Hoell, ed. Washington Dec. 1984 139 p refs Workshop held in Palo Alto, Calif., 16-20 Aug. 1982
(NASA-CP-2332; L-15847; NAS 1.55:2332) Avail: NTIS HC A07/MF A01 CSCL 04A

In its continuing efforts to direct its applications programs towards relevant national needs, NASA is conducting the Tropospheric Chemistry Program, the long-range objective of which is to apply NASA's space technology to assess and predict human impact on the troposphere, particularly on the regional to global scale. One area of required research is instrumentation development, which is aimed at improving the capability to measure important trace gases and aerosols which are key species in the major atmospheric biogeochemical cycles. To focus on specific needs, the Instrumentation Worksphop for H(x)O(y) Tropospheric Species was conducted in August 1982. The workshop discussed current measurement needs and instrument capabilities for H(x)O(y) species, including OH, HO2, and H2O2. The workshop activities and conclusions are documented. For individual titles, see N85-14337 through N85-14344.

N85-14337*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ASSESSMENT OF TECHNIQUES FOR MEASURING TROPOSPHERIC H SUB x O SUB y: SUMMARY
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 1-72 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

The objectives were: (1) to provide an assessment of the capability of the existing sensors of HxOy species at levels

characteristic of the nonurban troposphere; (2) to identify those techniques adaptable to real-time measurement (sampled or continuous) onboard an aircraft platform; (3) to address the concern for intercalibration and intercomparison of techniques for measuring specific species; and (4) to recommend promising technologies for research and development for measuring important species for which a capability does not now exist or is presently of inadequate sensitivity. B.G.

N85-14338*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FUNDAMENTAL EQUATIONS OF THE LIF HYDROXYL MEASUREMENTS, APPENDIX A
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 73-99 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

The equation relating OH concentration to the observed detector count rate for a given laser flux is defined. That equation, which will be referred to henceforth as the central equation for absolute sensitivity, will be cast in terms of standard spectroscopic quantities such as oscillator strengths, Hoenl-London factors, rotational and vibrational quantum numbers, etc., such that it may be tested directly under laboratory conditions. The working expressions used by each of the OH laser induced fluorescence (LIF) groups will be related to this central equation, thereby establishing a common language for the comparison of experimental results and the definition of LIF system performance. The relevant structural details of the OH radical via a spectroscopic description of the energy levels and transitions employed in the LIF method are detailed. The central equation relating observed count rate to absolute concentration will be derived, and that equation will be related to the observed quantities cited by each of the experimental groups engaged in the measurement of OH in the Earth's atmosphere. B.G.

N85-14339*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SATURATION PHENOMENA IN LIF MEASUREMENTS, APPENDIX B
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 100-104 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

Optical saturation is the phenomenon in which the laser-induced rates of absorption and spontaneous emission between two levels, induced by a laser, become comparable to or greater than the spontaneous emission and collision rates connecting these levels. This results in the excited state population N(u) acquiring a value of similar magnitude to that of the ground state, N(e). Under these conditions the observed fluorescence signal, which is proportional to N(u), is no longer linearly dependent on laser intensity I, but increases at a slower rate, and in principle ultimately becomes independent of I. A conceptual picture of optical saturation using a two-level picture is described. This is, however, inadequate for the description of a real experiment involving a molecule, such as OH, for several reasons, which will be explained briefly; these are the multi-level nature of the electronic states and energy transfer among them and effects due to spatial, spectral, and temporal fluctuations in the laser pulse. B.G.

N85-14340*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETAILED PERFORMANCE CALCULATIONS: WAYNE STATE UNIVERSITY AND FORD MOTOR COMPANY, APPENDIX C
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 105-109 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

The laser-generated OH through ozone dissociation is defined in equations. Using these equations, the ozone interference levels corresponding to various humidity and ozone concentrations can be calculated readily. Author

N85-14341*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETAILED PERFORMANCE CALCULATIONS: GODDARD GROUP, APPENDIX D
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 110-114 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

Two systems were described. The first used polarization to reduce scattered solar flux, the principal source of noise. The second used a narrowband detector and a different excitation wavelength. The results, which consider these systems, were presented emphasizing anticipated technology improvements because the analysis for each system required estimates of critical parameter even though each system would use existing technology. For the first, the information about the degree of polarization of the scattered solar flux was not measured but was estimated as 60 percent for viewing straight up with a solar zenith angle of 75 percent at sea level. The expected performance of this system therefore depends on the reliability of this estimate. For the second system, two estimates were required. First, the expected throughput of a Fabry-Perot interferometer operating at 309 nm, based on the performance exhibited by similar instruments working at other wavelengths, was estimated to be 3 percent. Second, the fluorescence efficiency of the proposed OH lines was estimated as 0.00004, since these quantities were not measured to date. B.G.

N85-14342*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETAILED PERFORMANCE CALCULATIONS: GEORGIA INSTITUTE OF TECHNOLOGY GROUP, APPENDIX E
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 115-119 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

Conditions for system intercomparison; signal strength evaluation; background total source strength; signal-to-noise ratio; performance of present Georgia Tech system; and special comments on current Georgia Tech system are discussed. B.G.

N85-14343*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETAILED PERFORMANCE CALCULATIONS: PORTLAND STATE GROUP, APPENDIX F
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 120-121 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

For the Portland State University FAGE instrument, laser induced OH is calculated from (OH) laser = Cl(03)amb(H2O)amb. The dominant noise sources are the photon-counting fluctuations associated with the OH signal and the fluorescence background as well as concentration fluctuations in OH and in the species causing the background. Baric filtering and temporal filtering suppress the background by factors of 10 each. B.G.

N85-14344*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETAILED PERFORMANCE CALCULATIONS: HARVARD GROUP, APPENDIX G
In its Assessment of Tech. for Measuring Tropospheric H sub x O sub y Dec. 1984 p 122-129 refs (For primary document see N85-14336 05-46)
Avail: NTIS HC A07/MF A01 CSCL 04A

The measurement of OH density in the troposphere has many elements in common with the system that is currently used for in situ measurements of OH in the stratosphere. Techniques proposed by Harvard University and Washington State University are described. B.G.

N85-14345# California Univ., Livermore. Lawrence Livermore Lab.

ATMOSPHERIC STUDIES IN COMPLEX TERRAIN Technical Progress Report, 1979 - 1983
M. H. Dickerson, ed. and P. H. Gudiksen, ed. Aug. 1983 372 p refs
(Contract W-7405-eng-48)
(DE84-008553; UCID-198512ASCOT-84-1) Avail: NTIS HC A16/MF A01

A program aimed specifically at atmospheric studies in complex terrian was developed (ASCOT). The ASCOT program was designed to develop the technology needed to assess atmospheric properties and the impact of energy sources on air quality in areas of complex terrain. The technical achievements made since the program began are summarized and will be used as a basis for describing future accomplishments of ASCOT. The report is divided into three separate and interrelated sections: (1) measurements, (2) physical concepts, and (3) modeling. DOE

N85-14346# Western Research Inst., Laramie, Wyo.
GEOLOGY AND RESOURCES OF THE TAR SAND TRIANGLE, SOUTHEASTERN UTAH
G. F. Dana, R. L. Oliver (Associated Western Univ., Inc., Salt Lake City), and J. R. Elliott (Earth Engineering and Evaluation, Laramie, Wyo.) May 1984 56 p refs
(Contract DE-FC21-83FE-60177)
(DE84-012017; DOE/FE-60177/1625) Avail: NTIS HC A04/MF A01

The Tar Sand Triangle is located in southeastern Utah between the Dirty Devil and Colorado Rivers and covers an area of about 200 square miles. The geology of the area consists of gently northwest dipping strata exposed in the box canyons and slopes of the canyolands morphology. Strata in the area range in age from Jurassic to Permian. The majority of tar sand saturation is found in the Permian White Rim Sandstone Member of the Cutler Formation. The White Rim Sandstone Member consists of a clean, well sorted sandstone which was deposited in a shallow marine environment. The total in place resources, are 6.3 billion barrels. Previous estimates ranged from 2.9 to 16 million barrels. More coring and analyses is necessary before a more accurate determination of resources is attempted. DOE

N85-14347# Argonne National Lab., Ill.
CRYSTALLINE ROCKS OF THE NORTHEASTERN UNITED STATES
W. Harrison, M. Flower, M. Sood, M. Tisue, and D. Edgar Oct. 1983 106 p
(Contract W-31-109-eng-38)
(DE84-013674; ANL/ES-137-Pt-2) Avail: NTIS HC A06/MF A01

A compendium is given of the available information on Vermont, northeastern New York (Adirondack Mountains), Massachusetts, Rhode Island, Connecticut, southeastern New York, northern New Jersey, and southeastern Pennsylvania. Crystalline rocks are defined as bodies of medium- and coarse-grained igneous and high-grade metamorphic rocks. The study was undertaken to provide background information to assist in evaluating the geologic suitability of such rocks for isolating high-level radioactive waste. Maps of the major crystalline rock associations and faults of the northeastern US are given. DOE

N85-14348# Los Alamos Scientific Lab., N. Mex.
HOT PLASMA PARTICLES IN THE EARTH'S OUTER MAGNETOSPHERE: NEW UNDERSTANDINGS DURING THE IMS
D. N. Baker and T. A. Fritz 1984 13 p refs Presented at 25th Plenary Session of COSPAR, 25 Jun. 1984
(Contract W-7405-eng-36)
(DE84-016826; LA-UR-84-2611; CONF-8406167-2) Avail: NTIS HC A02/MF A01

The major accomplishments made during the International Magnetospheric Study (IMS) period in clarifying magnetospheric particle variations in the region from roughly geostationary orbit altitudes into the deep magnetotail are reviewed. The review is divided into three topic areas: (1) acceleration processes; (2) transport processes; and (3) loss processes. Many of the changes in hot plasmas and energetic particle populations are often found to be related intimately to geomagnetic storm and magnetospheric substorm effects and, therefore, substantial emphasis is given to these aspects of particle variations. The IMS data, taken as a body, allow a reasonably unified view as one traces magnetospheric particles from their acceleration source through the plasma sheet and outer trapping regions to their loss via ionospheric precipitation and ring current formation processes. DOE

N85-14349# Argonne National Lab., Ill.
VARIABILITY OF SHORT-TERM EDDY-CORRELATION ESTIMATES OF MASS EXCHANGE
M. L. Wesely and R. L. Hart 1984 26 p refs Presented at the Forest Environmental Measurements Conf., Oak Ridge, Tenn., 23 Oct. 1984
(Contract W-31-109-eng-38)
(DE84-007271; CONF-841039-1) Avail: NTIS HC A03/MF A01

The signals from sensors used to measure atmospheric scalar fluctuations ordinarily produce characteristic spectra and cospectra with vertical wind velocity that are strongly influenced by vertical transport processes. Unwanted signal noise generated by some fast-response chemical sensors, however, distort the spectra and cospectra and increase run-to-run variability of eddy-correlation flux estimates. Instead of data collection periods of only 30 min needed to provide a precision of approximately 10 to 20% in each flux estimate obtained at heights of 5 to 10 m during typical daytime conditions, an ensemble derived from several such runs is necessary with certain sensors in order to achieve comparable precision. This has been the practical experience obtained in numerous experiments above various natural surfaces, and is verified to a limited extent by both empirical and theoretical investigations. DOE

N85-14350# European Space Agency, Paris (France).
RELATION BETWEEN ATMOSPHERIC SCATTERING AND BACKSCATTERING COEFFICIENT
Heribert vonRedwitz Jun. 1984 35 p refs Transl. into ENGLISH of "Verhaeltnis von in der Atmosphaere', DFVLR Rept. DFVLR-FB-83-20, 1983 Original report in GERMAN previously announced as N84-16989
(ESA-TT-837; DFVLR-FB-83-20) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 14,50

The airborne backscatter instrument used for the Optical Atmospheric Quantities in Europe project was calibrated to absolute values and compared with the recorded values from an integrating nephelometer. The ratio between the coefficient of atmospheric scattering and the coefficient of atmospheric backscattering varies from 8.4 for Rayleigh conditions to 32 in fog. The spread of individual measured values around this adjusted curve is lower than expected by Mie calculations using known particle size distributions and refractive indices. The significantly lower mathematical spread of the measured scatter coefficient to backscatter coefficient ratio compared with Mie calculations is presumably caused by a coupling effect between particle size and refractive index in the atmosphere. Author (ESA)

N85-14351# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solid Earth Geophysics.
DOCUMENTATION OF EARTHQUAKE ALGORITHMS
E. R. Engdahl Jul. 1984 53 p refs Prepared in cooperation with Geological Survey, Denver
(PB84-235324; NOAA-84081402) Avail: NTIS HC A04/MF A01 CSCL 08K

Optimization of Algorithms for the Determination of Earthquake Parameters was established. The optimization of algorithms for earthquake location was extended to include other source parameters. A program to document existing algorithms for optimally estimating earthquake parameters was initiated. Algorithms to locate earthquakes and to retrieve earthquake source parameters and related algorithms to determine earth structure and construct synthetic seismograms are examined. GRA

N85-14352# National Academy of Sciences - National Research Council, Washington, D. C. Scientific Committee on Antarctic Research Polar Research Board.
REPORT ON UNITED STATES ANTARCTIC RESEARCH ACTIVITIES, FEBRUARY 1983 - OCTOBER 1984 AND UNITED STATES ANTARCTIC RESEARCH ACTIVITIES PLANNED FOR OCTOBER 1984 - SEPTEMBER 1985
Jun. 1984 107 p
(Grant NSF DPP-82-0798)
(PB84-231265; Rept-26) Avail: NTIS HC A06/MF A01 CSCL 04A

A listing of research activities comprising the U.S. Antarctic Research Program, including those completed from February 1983 to March 1984, in progress from March 1984 to October 1984, and planned for October 1984 through September 1985 is given. Included also is a bibliography of papers and books selected from Current Antarctic Literature. For each project, the nature and location of the work are indicated together with principal investigators and additional sources of data and related information. GRA

N85-14353# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solar-Terrestrial Physics.
EXPERIENCE WITH PROPOSED IMPROVEMENTS OF THE INTERNATIONAL REFERENCE IONOSPHERE (IRI)
K. Rawer, ed. (Freiburg Univ.) and C. M. Minnis, ed. (International Union of Radio Science) May 1984 248 p refs
(PB84-235670; UAG-90; NOAA-84081403) Avail: NTIS HC A11/MF A01 CSCL 04A

Improvements of the international reference ionosphere (r) are proposed. The following topics are discussed: electron density profile (D and E region, bottomside F region, topside, variability); plasma temperatures (electron temperature, ion and electron temperatures variability); ionospheric structure (ionic composition, planetary distribution, present and future (IRI)). GRA

N85-14354 Arizona Univ., Tucson.
SEDIMENTATION, STRUCTURE AND TECTONICS OF THE UMPQUA GROUP (PALEOCENE TO EARLY EOCENE), SOUTHWESTERN OREGON
Paul Thomas Ryberg 1984 422 p
Avail: Univ. Microfilms Order No. DA8421981

A major change in sedimentary and structural style occurs in Eocene strata exposed along the southern margin of the Oregon Coast Range. Lithofacies of the early Tertiary Umpqua Group are described, mapped and assigned to likely depositional environments. Submarine fan and slope facies (upper Roseburg Formation) overlie Paleocene basaltic basement rocks to the north, whereas fluvial, deltaic and shallow marine facies (Lookingglass Formation) overlie Franciscan equivalent strata to the south along the flank of the Klamath Mountains. These two depositional systems are gradational into one another, and were prograding northwestward until about 52 Ma. Means of clast compositions from sandstones and conglomerates from both the Roseburg and Lookingglass Formations suggest derivation from identical recycled orogen or arc continent collision sources in the Klamath Mountains.
Dissert. Abstr.

N85-14184*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BIOGEOCHEMICAL CYCLES: INTERACTIONS IN GLOBAL METABOLISM
B. Moore (New Hampshire Univ., Durham), H. Morowitz (Yale Univ., New Haven, Conn.), and M. N. Dastoor *In its* The interaction of Global Biochemical Cycles 15 Jan. 1984 p 17-24 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

N85-14188*# Woods Hole Oceanographic Institution, Mass.
GLOBAL CARBON - NITROGEN - PHOSPHORUS CYCLE INTERACTIONS: A KEY TO SOLVING THE ATMOSPHERIC CO2 BALANCE PROBLEM?
B. J. Peterson and J. M. Melillo *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 97-116 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

N85-14189*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THREE DIMENSIONAL GLOBAL MODELING OF ATMOSPHERIC CO2
J. Hanse, I. Fung, and D. Rind *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 117-140 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

N85-14191*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NITROGEN CYCLE: ATMOSPHERE INTERACTIONS
J. S. Levine *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 179-208 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

N85-14195*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AIR-SEA HEAT EXCHANGE, AN ELEMENT OF THE WATER CYCLE
M. T. Chahine *In its* The interaction of Global Biochemical Cycles 15 Jan. 1984 p 253-255 refs (For primary document see N85-14183 05-42)
Avail: NTIS HC A12/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-14355 New York Univ., New York.
MULTI-PROPERTY MODELING OF THE MARINE BIOSPHERE IN RELATION TO GLOBAL CLIMATE AND CARBON CYCLES Ph.D. Thesis
Tyler Volk 1984 368 p
Avail: Univ. Microfilms Order No. DA8421570

A natural hierarchy of tracers based upon biological source term complexity gives a systematic sequencing for a modeling procedure, which should be generally applicable to different types of models that need multiproperty outputs. The procedure moves from dynamics to single source tracers to double source tracers. The surface water pCO2m and temperature relationship is examined seasonally, geographically and biologically. The relative strengths of biology and dynamics as pumps that affect pCO2 concentration differences are calculated. The mathematics of a 2-D isopycnal mixing model are presented. Along and across isopycnal diffusivities are rotated to horizontal and vertical diffusivities. Along with thermohaline circulation, equatorial upwelling and mid latitude gyre downwelling represents a wind driven circulation. The 2-D model's extension to biochemical tracers using the multiproperty modeling procedure and the 1-D circulation scheme conclusions is formulated. Dissert. Abstr.

N85-14356 Pennsylvania State Univ., University Park.
CONDITIONAL SYMMETRIC INSTABILITY AND MESOSCALE RAINBANDS Ph.D. Thesis
Qin Xu 1984 206 p
Avail: Univ. Microfilms Order No. DA8419701

Conditional symmetric instability (CSI), i.e., the stability of a conditionally saturated moist basic flow with vertical and horizontal shear to transverse perturbations, is investigated. It is shown that there exists a similarity among SI (Symmetrical Instability), BI (Buoyancy or Convective Instability), and II (Inertial Instability). Local dynamical considerations suggest that CSI circulations will be slantwise and lie between the most unstable direction of the moist basic state and least stable direction of the dry basic state. For a uniform basic flow in which the wind shear, dry and moist stratifications are constant, linear solutions are found for different

CSI modes, e.g., isolated, periodic, and hybrid modes. Inviscid growth rates, spatial structures including the formulae for the width and slope angle of moist updraft, and stability criteria are found and discussed. When a bulk viscosity is accounted for, the most rapidly growing CSI circulations bear a close resemblance to some observed rainbands. The stability criterion of viscous CSI also shows a better comparison with observational data than inviscid CSI. Dissert. Abstr.

N85-14357# Hydrometeorological Inst. (Czechoslovakia).
USE OF PHOTOGRAPHS OF METEOROLOGIC SATELLITES IN SYNOPTIC ANALYSIS [VYUZITI SNIMKU Z METEOROLOGICKYCH DRUZIC PRI SYNOPTICKE ANALYZE]
Jan Pavlik 1983 55 p refs In CZECHOSLOVAKIAN (Sesit-5) Copyright. Avail: NTIS HC A04/MF A01

The current use and future role of observations from meteorologic satellites are discussed. Satellite photographs are expanding present knowledge of the status and behavior of the atmosphere, and they enhance the quality of meteorologic analysis and forecasting. Thirty-nine satellite photographs of different areas of the Earth's surface are included. B.G.

N85-14358*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-41D) LAUNCH
D. L. Johnson, C. K. Hill, G. Jasper, and G. W. Batts (Computer Sciences Corp., Huntsville, Ala.) Oct. 1984 51 p refs (NASA-TM-86484; NAS 1.15:86484) Avail: NTIS HC A04/MF A01 CSCL 04B

Selected atmospheric conditions observed near Space Shuttle STS-41D launch time on August 30, 1984, at Kennedy Space Center, Florida are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given as well as wind and thermodynamic parameters representative of surface and aloft conditions in the SRB descent/impact ocean area. Final atmospheric tapes, which consist of wind and thermodynamic parameters versus altitude, for STS-41D vehicle ascent and SRB descent/impact were constructed. The STS-41D ascent meteorological data tape was constructed by Marshall Space Flight Center's Atmospheric Science Division to provide an internally consistent data set for use in post flight performance assessments. Author

N85-14359# National Weather Service, Silver Spring, Md. Techniques Development Lab.
VERY SHORT RANGE STATISTICAL FORECASTING OF AUTOMATED WEATHER OBSERVATIONS Interim Report, Sep. 1983 - Oct. 1984
Robert G. Miller Washington FAA Nov. 1984 23 p refs (Contract DTAF01-83-Y-20625) (DOT/FAA/PM-84/31) Avail: NTIS HC A02/MF A01

A procedure is developed for providing weather forecasting guidance over the short period between 1 to 60 minutes. It uses automated surface observation elements as predictors and predictands. The same equations project probabilistic predictions iteratively minute-by-minute. The model is founded on a Markov assumption and utilizes multivariate linear regression as the statistical operator. Details are given on how the model is constructed and how it compares with other objective methods such as climatology and persistance. Tests are performed on a new nonlinear approach. Author

N85-14360*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL SCALE ATMOSPHERIC PROCESSES RESEARCH PROGRAM REVIEW
Barbara A. Worley, ed. and Cindy Peslen, ed. Washington Nov. 1984 233 p refs Rev. held in Greenbelt, Md., 8-10 Aug. 1984 (NASA-CP-2344; NAS 1.55:2344) Avail: NTIS HC A11/MF A01 CSCL 04B

Global modeling; satellite data assimilation and initialization; simulation of future observing systems; model and observed energetics; dynamics of planetary waves; First Global Atmospheric Research Program Global Experiment (FGGE) diagnosis studies; and National Research Council Research Associateship Program are discussed. For individual titles, see N85-14361 through N85-14412.

N85-14361*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLAS FOURTH ORDER MODEL
E. Kalnay *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 3-10 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

A general circulation model for numerical weather prediction, analysis, and forecast impact experiments, stratospheric analysis, and extended range weather forcasting was developed. B.G.

N85-14362*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OROGRAPHIC EFFECTS IN ATMOSPHERIC CIRCULATION
D. G. Duffy *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 11 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The role of orography on the large-scale and regional atmospheric circulation, with special emphasis on lee cyclogenesis was studied. Effects observed in the actual atmosphere as well as numerical weather prediction and general circulation models are included. B.G.

N85-14363*# Cambridge Hydrodynamics, Inc., Mass.
SPECTRAL GENERAL CIRCULATION MODEL DEVELOPMENT
S. A. Orszag, R. L. McCrory, and C. P. Verdon *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 12-13 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

A spectral general circulation model was developed to run on the Cyber 205 computer system installed at the NASA Goddard Space Flight Center. This model should enhance the utility of satellite-based observation systems for accurate long-range weather prediction. B.G.

N85-14364*# Maryland Univ., College Park.
BIOSPHERE/ATMOSPHERE INTERACTIONS
Y. Mintz *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 14-18 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Vegetation influences the energy, mass and momentum exchange between land-surface and atmosphere and, in that way, may significantly affect weather and climate. The morphology and physiology of the vegetation determine the surface albedo, precipitation interception and interception loss, stomatal control of transpiration, moisture storage in the root zone and, through the vegetation roughness height, the aerodynamic resistance to the transfers of latent and sensible heat and momentum between land-surface and atmosphere. That the albedo and soil moisture have a large influence on the atmospheric circulation and rainfall was demonstrated in sensitivity experiments with general circulation models. Moreover, through its effect on the convergence of the horizontal water vapor transport in the planetary boundary layer, the surface roughness height has a large influence on rainfall. B.G.

N85-14365*# New York Univ., New York.
FULLY IMPLICIT NUMERICAL METHODS FOR THE BAROCLINIC PRIMITIVE EQUATIONS
S. E. Cohn and E. Isaacson *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 19-24 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

A fully implicit code was developed to solve the three-dimensional primitive equations of atmospheric flow. The scheme is second order accurate in time and fourth order accurate in the horizontal and vertical directions. Furthermore, as a result of being fully implicit, the time step is not restricted by the mesh spacing near the poles, nor by the speed of inertia-gravity waves. Rather, the time step, deltat is determined simply by the requirement that it be small enough to adequately resolve the atmospheric flow of interest. The accuracy and efficiency of current models for fine grids should be significantly improved. B.G.

N85-14366*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MASSIVELY PARALLEL PROCESSOR
M. Suarez *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 25 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The feasibility of using the Massively Parallel Processor (MPP) and possible future machines with parallel architecture for weather prediction and climate simulation was studied. A shallow water model and a two-level primitive equations model were implemented. B.G.

N85-14367*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A VERTICALLY RESOLVED PLANETARY BOUNDARY LAYER
H. M. Helfand *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 26-27 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Increase of the vertical resolution of the GLAS Fourth Order General Circulation Model (GCM) near the Earth's surface and installation of a new package of parameterization schemes for subgrid-scale physical processes were sought so that the GLAS Model GCM will predict the resolved vertical structure of the planetary boundary layer (PBL) for all grid points. B.G.

N85-14368*# Florida State Univ., Tallahassee.
AN INVESTIGATION OF THE MARINE BOUNDARY LAYER DURING COLD AIR OUTBREAK
S. A. Stage *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 28-30 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Various aspects of the marine atmospheric boundary layer (MABL) during cold air outbreak using data from the Mesoscale Air Sea Interaction Experiment (MASEX) and using a model for the MABL developed by Stage and Businger (1981,b) were studied. Several areas were identified for emphasis in this project: (1) determination of the momentum budget and divergence of the MABL; (2) development and testing of techniques for the remote determination of ocean surface sensible and latent heat fluxes by use of satellite data; (3) use of MASEX data to evaluate various techniques for parameterizing layer turbulence, to determine the typical magnitudes of such parameters and to improve the MABL model; and (4) use of the resulting MABL model and understanding of layer parameters to develop and evaluate more sophisticated schemes for remotely sensing layer evolution and sea surface sensible and latent heat fluxes. B.G.

N85-14369*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRUCTURE AND GROWTH OF THE MARINE BOUNDARY LAYER
M. McCumber *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 31-34 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

LANDSAT visible imagery and a one-dimensional Lagrangian boundary layer model were used to hypothesize the nature and the development of the marine boundary layer during a winter episode of strong seaward cold air advection. Over-water heating and moistening of the cold, dry continental air is estimable from linear relations involving horizontal gradients of the near-surface air temperature and humidity. A line of enhanced convection paralleling the Atlantic U.S. coast from south of New York Bay to the vicinity of Virginia Beach, VA was attributed to stronger convergence at low levels. This feature was characterized as a mesoscale front. With the assistance of a three-dimensional mesoscale boundary layer model, initialized with data obtained from the MASEX, the marine boundary layer can be mapped over the entire Atlantic coastal domain and the evolution of the boundary layer can be studied as a function of different characteristics of important surface level forcings. The effects on boundary layer growth due to the magnitude and pattern of sea surface temperature, to the shape of the coastline, and to atmospheric conditions, such as the orientation of the prevailing wind are examined. B.G.

N85-14370*# Massachusetts Inst. of Tech., Cambridge.
NUMERICAL MODELING OF THE ATMOSPHERE
P. H. Stone *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 35-36 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Numerical models and numerical analyses of observations were used to improve the understanding of the physical processes important in global weather and climate. Results from a study of the effect of baroclinic waves on mid-latitude vertical temperature structure show that the waves' vertical eddy heat flux tend to eliminate the potential vorticity gradient near the steering level by causing the static stability to decrease rapidly with height in the lower troposphere above the boundary layer. An empirical study of the relationship between eddy heat fluxes and the meridional temperature gradient has been completed. The results indicate that the feedback in the flux-gradient system is comparable to dissipation on all time scales between the synoptic and the seasonal. The definition of the Eliassen-Palm flux and the Eliassen-Palm and non-acceleration theorems has been generalized to include eddy forcing of condensation. Calculations based on the generalized diagnostics showed that the annual mean eddy forcing of the zonal mean zonal wind is two and one half times stronger when the condensation effects are included. B.W.

N85-14371*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF OPTIMUM INTERPOLATION AND CRESSMAN ANALYSES
W. E. Baker, S. C. Bloom, and M. S. Nestler (Sigma Data Computing Corp., Rockville, Md.) *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 39-41 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The objective of this investigation is to develop a state-of-the-art optimum interpolation (O/I) objective analysis procedure for use in numerical weather prediction studies. A three-dimensional multivariate O/I analysis scheme has been developed. Some characteristics of the GLAS O/I compared with those of the NMC and ECMWF systems are summarized. Some recent enhancements of the GLAS scheme include a univariate analysis of water vapor mixing ratio, a geographically dependent model prediction error correlation function and a multivariate oceanic surface analysis. B.W.

N85-14372*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NORMAL MODE INITIALIZATION
S. C. Bloom *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 42-43 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The objective of this research is the development and implementation of normal mode procedures for use with the GLAS analysis/forecast system. Specific tasks of this work include: (1) high latitude filtering of model fields to preserve the GLAS GCM's linear stability during integration; (2) development of nonlinear

normal mode initialization (NLNMI) processes, both adiabatic and diabatic. Using NLNMI to initialize GLAS analyses; investigation of the impact of normal mode initialization on the GLAS analysis/forecast system, especially in regard to data assimilation; and (3) diagnosis of the 1-3 day systemic forecast errors of the GLAS GCM. Author

N85-14373*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORECAST IMPACT OF COMPONENTS OF THE FGGE OBSERVING SYSTEM
E. Kalnay, R. Atlas, W. Baker, and J. Susskind *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 44-53 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Experiments have been conducted to assess the summer and winter forecast impact of the FGGE system, and of its main observing components: temperature sounding data derived from the TIROS-N polar orbiting satellite, cloud track winds determined from geostationary satellite observations and drifting buoy data which were collected by satellite during FGGE. The Analysis/Forecast System used has a number of improvements upon the system utilized by Halen et al. (1982) for the FGGE Special Observing Period-1 (SOP-1). Several modifications were made in the analysis scheme, the most important being the interpolation of the analysis minus 6 h forecast deviations rather than of the analyzed fields themselves. The forecast model is still the 4 deg lat, 5 deg lon and 9 vertical levels GLAS Fourth Order GCM with several minor corrections implemented in the physics and numerics. The improved vertical interpolation in the analysis resulted in better assimilation of rawinsonde data, which has more vertical structure than satellite data. As a result, there was an improvement of the forecasts derived from conventional data only, and, consequently, a small reduction of the positive impact of satellite data from that obtained by Halem et al. (1982). B.W.

N85-14374*# New York Univ., New York.
APPLICATIONS OF SEQUENTIAL ESTIMATION TO NUMERICAL WEATHER PREDICTION
M. Ghil *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 54-57 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The main objective of this cooperative research with NASA's Goddard Laboratory for Atmospheric Sciences (GLAS) is to use information about the atmosphere acquired from new types of observations, especially from satellites, in order to deepen our understanding of its behavior on time scales from hours to years. This is achieved by: (1) improving the methods for processing point observations into complete fields in space and time, using sequential estimation theory; and (2) analyzing low-frequency atmospheric variability by the methods of dynamical system theory, suitably modified to enhance practical predictability. Author

N85-14375*# Wisconsin Univ., Madison.
SOME NEW MATHEMATICAL METHODS FOR VARIATIONAL OBJECTIVE ANALYSIS
G. Wahba and D. R. Johnson *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 58-62 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

New and/or improved variational methods for simultaneously combining forecast, heterogeneous observational data, a priori climatology, and physics to obtain improved estimates of the initial state of the atmosphere for the purpose of numerical weather prediction are developed. Cross validated spline methods are applied to atmospheric data for the purpose of improved description and analysis of atmospheric phenomena such as the tropopause and frontal boundary surfaces. B.W.

N85-14376*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXTENDED RANGE FORECASTING
E. Kalnay, A. Dalcher (Sigma Data Computing Corp., Rockville, Md.), and Y. Sud *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 63-68 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Atmospheric predictability is explored between a week and a month by means of the use of comprehensive atmospheric models. Emphasis will be on a priori estimations of forecast skill. B.W.

N85-14377*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WEATHER AND CLIMATE PARAMETERS FROM TIROS-N
J. Sussking and D. Reuter *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 71-72 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The objective of the research is to develop a processing system for analysis of HIRS2/MSU data on the TIROS/NOAA meteorological satellites to be used both to improve forecasting skill and to develop climatological data for at least a five year period. Research involves both the development of improved techniques and validation studies of the retrieved products. Author

N85-14378*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WATER VAPOR PROFILE RETRIEVALS FROM THE HIRS/MSU SATELLITE SOUNDER
D. Reuter and J. Susskind *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 73-78 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The objective of this research is to develop a method for the retrieval of atmospheric water vapor profiles within the context of the GLAS physically based retrieval scheme. The GLAS retrieval method is currently capable of producing accurate atmospheric temperature retrievals as well as cloud fields and retrieved surface properties such as temperature and microwave emissivity. In the GLAS retrieval scheme, the water vapor field used in the computation of the atmospheric transmittance functions is obtained from a 6 hour forecast and is not modified in the retrieval process. Improved estimates of the water vapor field, in addition to being in themselves variables of meteorological interest, may, therefore, result in improved estimates of the other retrieved parameters obtained from the system. Author

N85-14379*# Texas Univ., Austin.
APPLICATIONS OF TOMS OZONE DATA AND CLUSTERING TECHNIQUES IN SATELLITE SOUNDINGS
M.-J. Munteanu *In* NASA. Goddard Space Flight Center Global Scale Atmosperic Processes Res. Program Review Nov. 1984 p 79-86 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Two primary areas are being pursued: (1) Applications of TOMS total ozone data to estimate the tropopause height and consequently to improve the temperature retrievals from satellite measurements; and (2) Applications of cluster analysis to satellite soundings. The strategy is to either use regression retrievals stratified by tropopause or to use the tropopause information as a constraint on the solution to the physical retrieval method. B.W.

N85-14380*# Massachusetts Inst. of Tech., Cambridge.
RESEARCH RELATIVE TO HIGH SPATIAL RESOLUTION PASSIVE MICROWAVE SOUNDING SYSTEMS
D. H. Staelin and P. W. Rosenkranz *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 87-91 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Methods to obtain high resolution passive microwave weather observations, and understanding of their probable impact on numerical weather prediction accuracy were investigated. The development of synthetic aperture concepts for geosynchronous passive microwave sounders were studied. The effects of clouds,

precipitation, surface phenomena, and atmospheric thermal fine structure on a scale of several kilometers were examined. High resolution passive microwave sounders (e.g., AMSU) with an increased number of channels will produce initialization data for numerical weather prediction (NWP) models with both increased spatial resolution and coverage. The development of statistical models for error growth in high resolution primitive equation NWP models which permit the consequences of various observing system alternatives, including sensors and assimilation times and procedures is discussed. A high resolution three dimensional primitive equation NWP model to determine parameters in an error growth model similar to that formulated by Lorenz, but with more degrees of freedom is utilized. E.A.K.

N85-14381*# Virginia Univ., Charlottesville.
INVESTIGATION OF SATELLITE MEASUREMENTS IN THE PRESENCE OF CLOUDS, FORCING INFLUENCES ON CLOUDS AND FEEDBACK TO THE LARGE SCALE FOLLOWING CONVECTION
C. Warner *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 92-94 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Satellite measurements during cloudy conditions, forces influencing clouds and large scale feedback following convection were investigated. The following conditions were studied: (1) passing marked thermal features aloft near the northern Bay of Bengal at the time of formation of the July 1979 monsoon depression; (2) recognition of regions of dense high overcast clouds in satellite radiances; (3) evolution of monsoon cloud systems and controlling factors on the clouds, and the effects of the clouds on thermodynamic and wind structures for improvements for numerical models are suggested. E.A.K.

N85-14382*# Washington Univ., Seattle.
STUDIES OF ATMOSPHERIC WATER IN STORMS WITH THE NIMBUS 7 SCANNING MULTICHANNEL MICROWAVE RADIOMETER
K. B. Katsaros *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 95-100 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The new tools for the study of midlattitude cyclones by atmospheric water channels of the scanning multichannel microwave radiometer (SMMR) on Nimbus 7, were discussed. The integrated atmospheric water vapor, total cloud liquid water and rain data were obtained from the Nimbus 7 Scanning Multichannel Microwave Radiometer (SMMR). The frontal structure of several midlattitude cyclones over the North Pacific Ocean as they approached the West Coast of North America were studied. It is found that fronts are consistently located at the leading edge of the strongest gradient in integrated water vapor. The cloud liquid water content has patterns which are consistent with the structure seen in visible and infrared imagery. The rain distribution is a good indicator of frontal location. It is concluded that the onset of rain on the coast can be forecast accurately by simple advection of the SMMR observed rain areas. E.A.K.

N85-14383*# Maryland Univ., College Park.
FIDELITY OF SATELLITE SOUNDINGS
O. Thompson *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 101 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Two pattern recognition procedures to provide improvements to first guess fields for satellite temperature retrievals were developed. The first technique where a radiometer measurement is used to select one or more historical radiosonde temperature profiles as analog estimates of ambient thermal structure. Radiosondes are the vertical scales of the analogs. The vertical resolving power of the satellite radiometer is relevant only to a decision process. The analog selection process is much more effective if implemented in an orthogonalized space of measurement information. The second procedure partitions a priori dependent data into shape coherent pattern libraries using structure information inherent in the data itself. It is shown that the pattern recognition techniques are able to reduce first guess profile errors by nearly 50%. The impact of pattern recognition on temperature retrieval error is assessed by regression and physical iterative retrieval algorithms. The influence of improved first guess fields is markedly different on these two types of algorithm. Pattern recognition was a strong positive impact on the physical iterative method. E.A.K.

N85-14384*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NOAA/NASA JOINT SIMULATION OF AMTS AND HIRS
J. Susskind and D. Reuter *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 105-108 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Sounding simulation test was designed to compare the relative accuracies of atmospheric temperature profiles retrieved from HIRS2, the current operational infrared temperature sounder, and AMTS, a proposed advanced high spectral resolution infrared sounder. Retrievals generated by GLAS, using their physical retrieval algorithm, and NESDIS, using their operational statistical regression algorithm, for both instruments under clear and cloudy conditions were compared. In the cloudy portion of the test, MSU data, corresponding to the microwave component of the current operational sounding system, was used in conjunction with both instruments to aid in cloud seeding. E.A.K.

N85-14385*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ECMWF/NMC/GLAS JOINT SIMULATION STUDY
R. Atlas *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 109-110 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Simulation experiments to provide a quantitative assessment of the potential impact of proposed observing systems on large scale numerical weather prediction are conducted. Instruments to be simulated include current conventional and satellite observing systems, advanced passive sounders such as the AMTS and AMSU, and active LIDAR systems for the measurement of wind, temperature and humidity profiles. The potential impact of individual observing systems, the effect of coverage, resolution, accuracy and assimilation methodology are studied. E.A.K.

N85-14386*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIMULATION EXPERIMENTS ON THE RELATIVE ACCURACY OF INFERRED ATMOSPHERIC STATES FROM IDEALIZED WIND AND TEMPERATURE PROFILING SYSTEMS
M. Halem and R. Dlouhy (Sigma Data Computing Corp., Rockville, Md.) *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 111-112 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The First GARP Global Experiment (FGGE) led to the planning, design and implementation of a global observing system. Technologies as coherent CO2 LIDAR systems and highly sensitive IR detectors offer the potential of more accurate global spaceborne observation systems. The advent of super computers allows general circulation modeling and more sophisticated data analysis schemes. The consideration of advanced spaceborne systems better suited to meet the new emerging requirements are suggested. The Global Weather Experiment provides us with a new baseline to assess data accuracy and forecasting capabilities which is used for study of the incremental performance. E.A.K.

N85-14387*# Wisconsin Univ., Madison.
THE USE OF AVAILABLE POTENTIAL ENERGY TO EVALUATE TWO GLAS FGGE DATA SETS
L. H. Horn and T. L. Kohler *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review

Nov. 1984 p 115 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Meteorological data derived from satellites provided an essential component of the FGGE data sets, especially in data sparse regions of the globe. The impact of satellite derived observations on objective analyses and numerical model predictions are investigated. The FGGE data sets and resulting numerical forecasts and the ability to define the available potential energy of the atmosphere, and its relationship to synoptic scale features such as extratropical cyclones are studied. E.A.K.

N85-14388*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
GENERATION OF AVAILABLE POTENTIAL ENERGY AND OTHER DIAGNOSTIC STUDIES DURING FGGE
D. A. Salstein and R. D. Rosen *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 116-121 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The energy cycle of the atmosphere was examined by utilizing gridded analyses of the state of the atmosphere produced by a special objective analysis system and the GLAS fourth order general circulation model. The analyses of a month period during the first special observing period of FGGE are produced at GLAS. The various diabatic heating fields necessary for direct computation of the generation of available potential energy (P) are recorded. E.A.K.

N85-14389*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF FORECAST AND OBSERVED ENERGETICS
W. E. Baker and Y. Brin (Sigma Data Computing Corp., Rockville, Md.) *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 122-125 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

An energetics analysis scheme was developed to compare the observed kinetic energy balance over North America with that derived from forecast fields of the GLAS fourth order model for the 13 to 15 January 1979 cyclone case. It is found that: (1) the observed and predicted kinetic energy and eddy conversion are in good qualitative agreement, although the model eddy conversion tends to be 2 to 3 times stronger than the observed values. The eddy conversion which is stronger in the 12 h forecast than in observations and may be due to several factors is studied; (2) vertical profiles of kinetic energy generation and dissipation exhibit lower and upper tropospheric maxima in both the forecast and observations; (3) a lag in the observational analysis with the maximum in the observed kinetic energy occurring at 0000 GMT 14 January over the same region as the maximum ddy conversion 12 h earlier is noted. E.A.K.

N85-14390*# Wisconsin Univ., Madison.
ENERGY DIAGNOSTICS AND IMPACT STUDIES OF FGGE GLOBAL DATA SETS AND GLAS GCM SIMULATIONS
D. R. Johnson *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 126-128 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

An analysis of a case study of the favorable impact of satellite data assimilation on model cyclone prediction is discussed. Also discussed is the isolation of systematic biases in the vertical structure of satellite derived temperatures which in all probability negatively impact the prediction of ocean cyclones during periods of rapid baroclinic amplification. Access to CYBER 205 and transfer of software for Eulerian and quasi-Lagrangian diagnostic studies of atmospheric circulation are discussed. R.J.F.

N85-14391*# Kung (E. C.) Research Consulting, Inc., Columbia, Mo.
SPECTRAL ENERGETICS DIAGNOSES AND FGGE SPECTRAL OBSERVING PERIODS AND ENERGETICS ANALYSES OF FORECAST EXPERIMENTS WITH GLAS GCM
E. C. Kung *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 129-132 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Energetics characteristics of Goddard Laboratory for Atmospheric Sciences (GLAS) General Circulation Models (GCM) as they are reflected on the First GARD GLobal Experiment (FGGE) analysis data set are discussed. Energetics descriptions of GLAS GCM forecast experiments are discussed as well as Eneretics response of GLAS GCM climatic simulation experiments. R.J.F.

N85-14392*# State Univ. of New York, Purchase.
JET STREAM ERRORS AND TROPOSPHERIC-STRATOSPHERIC INTERACTIONS IN THE GLAS GENERAL CIRCULATION MODEL
J. Tenenbaum *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 133-136 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

This project used the Goddard Laboratory for Atmospheric Sciences general circulation model (GCM) to explore the causes of erroneously weak shears above the subtropicl jet in GCMs. This problem was seen over the past 15 years of general circulation modeling both as a weak vertical shear and as a cold polar stratosphere. Although recent models now have closed zonal wind contours in their monthly Northern Hemisphere winter climatologies, the weak shears are still present in both winter, summer, Northern, and Southern hemispheres. Numerous hypotheses have been advanced to explain this failure including the rigid top, poor vertical resolution, incorrect modeling of radiative processes, and incorrect model generation of tropospheric waves. Although the Community Climate Model, attempted to deal with many of these causes, especially radiative processes, the problem is still present. R.J.F.

N85-14393*# Iowa State Univ. of Science and Technology, Ames.
ANALYSIS OF DIABATIC HEATING DURING FGGE
T.-C. Chen *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 137-138 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The objective is to examine the maintenance of momentum and thermal fields in the Southern Hemisphere and the diabatic heating and generation of available potential energy of the entire global atmosphere. The data generated by the Goddard Laboratory for Atmospheric Sciences First GARP Global Experiment (FGGE) III-b analysis for SOP1 and SOP2 are used for this effort. It is observed that the atmospheric circulation of the Southern Hemisphere exhibits double jet structure (subtropical jet and polar jet) in winter and a single jet in summer during the FGGE year. The geographic distribution of standard deviation in the height field at 500 mb indicates that the major eddy activities occur in the downstream side of the polar jet and poleward side of the subtropic jet in winter. However, the major eddy activites go hand-in-hand with the jet stream in summer. The momentum transport is essentially carried out by the transient eddies in both seasons. The distribution of the temperature field is more axisymmetric in the Southern Hemisphere than in the Northern Hemisphere. The sensible heat is mainly transported poleward by transient eddies along the strong baroclinic zone where the jet streams are located. In other seasons, it is shown from the geographic distribution of the divergence of transient eddy sensible heat flux that the Antarctic continent acts as a heat sink to consume the sensible heat converged toward the polar area from the middle and low latitudes. R.J.F.

N85-14394*# Utah Univ., Salt Lake City.
GLOBAL SCALE DIAGNOSIS OF FGGE DATA
J. Paegle *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 141-146 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The objective was to perform descriptive global-scale diagnoses of the Goddard Laboratory for Atmospheric Sciences (GLAS) First GARP Global Experiment (GLAS) SOP-1 analyses and to compare these diagnoses against controlled, real-data integrations of the GLAS General Circulation Model (GCM) as well as other data sets. The effects of critical latitudes, the diagnoses of the influence of tropical wind data and latent heating upon the GLAS GCM, investigations of planetary wave structure on various time scales from the diurnal to the monthly, and comparison of the GLAS analyses with other analyses are discussed. R.J.F.

N85-14395*# Scripps Institution of Oceanography, San Diego, Calif.
THEORETICAL MODELING FOR NUMERICAL WEATHER PREDICTION
R. C. J. Somerville *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 147-149 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The goal is to utilize predictability theory and numerical experimentation to identify and understand some of the dynamical processes which must be modeled more realistically if large-scale numerical weather predictions are to be improved. The emphasis is on the use of relatively simple models to exlore the properties of physically comprehensive general circulation models (GCM's). A global linear quasi-geostrophic model and the Goddard Laboratory for Atmospheric Sciences (GLAS) GCM were used to investigate several mechanisms which are responsible for the decay of large-scale forecast skill in mid-latitude numerical weather predictions. Five-day forecasts for an ensemble of cases were made using First GARP Global Experiment data. It was found that forecast skill depends crucially on the specification of the stationary forcing. A lack of stationary forcing leads to spurious westward propagation of the ultralong waves. Forecasts made with stationary forcings derived from climatological data are superior to those using forcings inferred from observations immediately preceding the forecast period. Interhemispheric forecast differences were analyzed, and the model errors were compared to errors of a simple persistence-damped-to-climatology scheme and to errors of the GLAS GCM. R.J.F.

N85-14396*# Massachusetts Inst. of Tech., Cambridge.
LARGE SCALE ROSSBY WAVES DURING FGGE
R. S. Lindzen, D. M. Straus (GSFC), and B. Katz (Maryland Univ. College Park) *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 150-154 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The purpose was to explore the behavior and significance of global-scale rotational normal modes (free Rossby waves) in the atmosphere. Although these modes received a great deal of attention n the past, the lack of accurate global data severely hampered efforts at estimating the amplitudes and time dependence of these waves in the real atmosphere. With the First GARP Global Experiment, the availability of accurate data that is truly global in coverage presents an important opportunity for a better understanding of the role of Rossby waves in the atmosphere. In the results presented, emphasis is placed on the temporal evolution of the amplitude and phase of the Rossby waves, rather than on characteristics of the time spectra of these waves. The first steps of the analysis consisted of projecting the 500 mb height and wind data onto Hough functions for each synoptic time. The seasonal cycle and time mean were removed separately for each season, and all remaining eastward propagating components removed on a seasonal basis; all remaining westward propagating components were retained. R.J.F.

N85-14397*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANETARY SCALE INTERACTIONS
W. K.-M. Lau *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 155-157 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Atmospheric teleconnections in the medium to long (10-90 days) time scales focusing on the interactions between extratropical circulation and tropical convection are studied. In a continuing effort to study short-term climate variability and atmospheric teleconnection as inferred from satellite observed outgoing longwave radiation, the low frequency variability (LFB) of tropical and extratropical cloud fluctuation over the Pacific was studied. It was found that during the Northern winter, the LFV of tropical cloud fluctuation is dominated by a 40-50 day dipole-like oscillation linking convection over Indonesia and the equatorial central Pacific. Eastward propagating signals appearing as outbursts of convective cloud clusters originating from the Indian Ocean appear to periodically feed energy into this dipole oscillation. It was also found that there are cloud features appearing over East Asia and subsequently over the eastern North Pacific which vary coherently with the tropical dipole anomaly. Based on analysis and an a priori phenomenological model, it is believed that the cloud fluctuations are associated with two space/time extended normal modes of tropical-extratropical interactions over the Pacific involving a coupling between the tropical dipole convective heating anomaly with cold surges over East Asia, and blocking over the eastern North Pacific respectively. R.J.F.

N85-14398*# Missouri Univ., Columbia.
A STUDY OF THE ADEQUACY OF QUASI-GEOSTROPHIC DYNAMICS FOR MODELING THE EFFECT OF FRONTAL CYCLONES ON THE LARGER SCALE FLOW
S. Mudrick *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 158-160 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The major objectives of this study are to test the validity of quasi-geostrophic (QG) dynamics, compared to primitive equation (PE) dynamics for modeling the effect of cyclone waves on the larger scale flow, and to study the formation of frontal cyclones and the dynamics of occluded frontogenesis. In order to extend the realism of the initial conditions over those used in earlier work of this nature and in order to include strong surface frontal zones in the initial conditions, a horizontal resolution on the order of 100 km between gridpoints is needed. In order to allow for integrations of up to two weeks simulated time and to keep the logistics and cost of the runs feasible, the horizontal domain of the models must be reduced. Based on work concerning polar lows, the tropospheric static stability was reduced and was also allowed to vary in different tropospheric layers. Previous work used a 'standard atmosphere' temperature lapse rate. Stratospheric stability remains unchanged. The use of one of these 'reduced stability' cases, with no surface frontal zone present resulted in the discovery of normal mode perturbations. R.J.F.

N85-14399*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUMERICAL PREDICTION OF THE PRESIDENT'S DAY CYCLONE
R. Atlas *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 163-166 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Numerical-diagnostic studies of major anomalous weather events are being conducted in order to investigate the relevant physical processes associated with the events and the role of satellite observing systems in the analysis and prediction of these phenomena. One component of this study is concerned with the numerical prediction of intense coastal and oceanic cyclogenesis. The specific objectives of this research are: (1) to assess the accuracy of Goddard Laboratory for Atmospheric Sciences model predictions of cyclogenesis, (2) to determine the importance of large scale dynamical processes and diabatic heating to the prediction, and (3) to evaluate the sensitivity of the model predictions to the initial conditions. It was shown that diabatic heating resulting from oceanic fluxes significantly contributed to

the generation of low level cyclonic vorticity and the intensification and slow rate movement of an upper level ridge over the western Atlantic. As an upper level short-wave trough approached this ridge, diabatic heating associated with the release of latent heat intensified, and the gradient of vorticity, vorticity advection, upper level divergence, and upward vertical motion in advance of the trough were greatly increased, providing strong large-scale forcing for the surface cyclogenesis. R.F.J.

N85-14400*# Naval Postgraduate School, Monterey, Calif.
OBSERVATIONAL-NUMERICAL STUDY OF MARITIME EXTRA-TROPICAL CYCLONES USING FGGE DATA
C. H. Wash and R. L. Elsberry *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Reivew Nov. 1984 p 167-170 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The accomplishments, current research, and future plans of a study investigating the development, maturation, and decay of maritime extratropical cyclones are reported. Three cases of explosive cyclogenesis during the first GARP global experiment (FGGE) DOP-1 were studied diagnostically using storm-following budgets derived from the ECMWF and GLAS level III-b analyses. Mass, vorticity and angular momentum budgets for the moving storm environment were computed for each case. Key results from these studies include: (1) demonstration that the FGGE analyses can be used to explore oceanic circulations; (2) isolation of the role of upper level jet streaks in the initiation of the explosive period in all three cases; and (3) illustration of the lower tropospheric destabilization during each rapid deepening period, which is primarily due to sensible heating of the cold air by the warmer ocean surface. The physics package of the Navy global forecast model was successfully utilized in a semi-prognostic mode to estimate diabatic components of oceanic cyclone systems. Fields of sensible and latent heat fluxes, radiational heating and inferred cloud structures were also computed. M.G.

N85-14401*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AIR-SEA INTERACTION DURING COLD AIR OUTBREAKS
S. Chou, Y. Yeh, and J. Firestone *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 171-173 (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The NOAA P-3 1-sec and 20 Hz gust probe data, dropsonde measurements, and lidar data were combined to study the organized convection and the effects of the coastal shape and the sea surface temperature (SST) pattern on the development of the marine atmospheric boundary layer (MABL) during cold air outbreaks. The preliminary analysis indicated that the SST pattern and the coastal shape caused the MABL to deepen eastward and southward, which is in good agreement with the suggestion of Atlas et al. (1983). Also, good agreements were found between the lidar data and the NOAA P-3 and dropsonde date, e.g., the boundary heights, the dominant scales of motion, and the heat flux ratio between the top of MABL and the sea surface. The planetary boundary layer (PBL) height measured by lidar was found to be in good agreement with that measured by the dropsonde temperature profile. Assuming a linear heat flux profile in the clear PBL, the heat flux ratio between the PBL top and the surface may be estimated from the ratio of the entrainment zone to the completely mixed boundary layer height. The heat flux ratio estimated by lidar measurements was found to be in good agreement with that derived from the gust probe data. M.G.

N85-14402*# Wisconsin Univ., Madison.
CAGE REGIONAL ENERGY BUDGETS FROM THE GLAS ATH ORDER MODEL
G. F. Herman, M. A. Alexder, and S. D. Shubert (GSFC) *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 175-180 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The status and future plans of a study to (1) assess the accuracy of regional energy balance calculations obtained from the 4th-order model, (2) determine the impact of satellite data on the calculations, and (3) determine their utility for ocean energy transport studies are discussed. An equation is presented which models the vertically-integrated, time and areally-averaged total energy content of a region of the atmosphere extending from the surface to the top of the atmosphere. All of the terms of the equation were evaluated using early versions of the GLAS FGGE IIIb analysis, and analysis with satellite data deleted. Results show that the budget is dominated by the surface fluxes, net radiation, and horizontal atmospoheric divergence. M.G.

N85-14403*# Iowa State Univ. of Science and Technology, Ames.
STRUCTURE AND ENERGETICS OF MEDIUM-SCALE ATMOSPHERIC WAVES IN THE SOUTHERN HEMISPHERE SUMMER
W. J. Randel and J. L. Stanford *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 181-186 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01

The NMC analyses were used to study medium-scale waves during three Southern Hemisphere (SH) summers. The SH summer medium-scale waves are observed to exhibit remarkably regular eastward phase progression, and wave maxima can often be traced continuously around the globe. Frequent downstream development of existing wave patterns is observed. The medium-scale waves at times appear to be longitudinally localized features; at other times they resemble truly global-scale models. The time-mean wave structure is found to be consistent with basic-state propagation characteristics and the conservation of wave activity. There is a tendency for background wind structure to restrict wave propagation. From energetics studies it is found that wave-zonal-mean exchange is a valid concept for describing the SH summer circulation, and that the flow vacillated between periods of highly perturbed and zonally symmetric states. The medium-scale waves result from nonlinear baroclinic instabilities, and exhibit a well-defined life cycle of baroclinic growth, maturity, and barotropic decay. M.G.

N85-14404*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
INVESTIGATION OF CLOUD FEEDBACK IN THE GLAS MODEL
W.-C. Wang *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 187-193 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

The theoretical and observational studies of cirrus clouds were reviewed to provide information for more realistic treatments of cirrus in the general circulation models. Based on the review, one time-step and ten-day model simulations were conducted to investigate the differences in the longwave radiation flux between the black and transparent cirrus treatment in the infrared. For both experiments substantial difference in the outgoing longwave flux at the top of the atmosphere is found. For the ten-day simulations, the differences in the convective, supersaturation and total cloudiness, temperature, and sensible and latent heat fluxes are also examined on various temporal and spatial scales. Although the cause-and-effect is difficult to identify, the results clearly suggest that on the time scale of a few days and longer cloud-radiation interactions play an important role. Sensitivity study of the longwave radiation flux to different longwave radiation parameterizations was performed by comparing the calculated fluxes between the Wu-Kaplan's scheme used in the present GLAS model and the Wang's schemes for climate studies. M.G.

N85-14405*# Wisconsin Univ., Milwaukee.
DIAGNOSTICS OF RAINFALL ANOMALIES IN THE NORDESTE DURING THE GLOBAL WEATHER EXPERIMENT
D. M. Sikdar *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 194-202 refs (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

The relationship of the daily variability of large-scale pressure, cloudiness and upper level wind patterns over the Brazil-Atlantic sector during March/April 1979 to rainfall anomalies in northern Nordeste was investigated. The experiment divides the rainy season (March/April) of 1979 into wet and dry days, then composites bright cloudiness, sea level pressure, and upper level wind fields with respect to persistent rainfall episodes. Wet and dry anomalies are analyzed along with seasonal mean conditions. M.G.

N85-14406*# South Dakota School of Mines and Technology, Rapid City.

RAIN VOLUME ESTIMATION OVER AREAS USING SATELLITE AND RADAR DATA

A. A. Doneaud, J. R. Miller, Jr., L. R. Johnson, T. H. VonderHaar (Colorado State Univ., Fort Collins), and P. Laybe (Colorado State Univ., Fort Collins) *In* NASA. Goddard Space Flight Center Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 203-209 (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

The application of satellite data to a recently developed radar technique used to estimate convective rain volumes over areas on a dry environment (the northern Great Plains) is discussed. The area time integral technique (ATI) provides a means of estimating total rain volumes over fixed and floating target areas of the order of 1,000 to 100,000 km(2) for clusters lasting $>$ 40 min. The basis of the method is the existence of a strong correlation between the area coverage integrated over the lifetime of the storm (ATI) and the rain volume. One key element in this technique is that it does not require the consideration of the structure of the radar intensities inside the area coverage to generate rain volumes, but only considers the rain event per se. This fact might reduce or eliminate some sources of error in applying the technique to satellite data. The second key element is that the ATI once determined can be converted to total rain volume by using a constant factor (average rain rate) for a given locale. M.G.

N85-14407*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

APPLICATION OF THE BOUNDED DERIVATIVE INITIALIZATION METHOD

F. H. M. Semazzi *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 213-216 refs (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

The utility of the bounded derivative method (BDM) as an initialization tool was examined using real data and the GLAS fourth order global barotropic model. Two constraints on initial data were derived. The first constraint based on the BDM is an equation for calculating initial divergence. The second constraint yields an additional equation of elliptic type for computing the initial height field. This equation is more general than the balance equation first proposed by Charney (1955). It also has more terms which include the contributions of initial divergence and orography. The development of a data insertion scheme based on the BDM is discussed. M.G.

N85-14408*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IMPLICIT NUMERICAL METHODS IN METEOROLOGY

J. Augenbaum *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 217-219 refs (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

The development of a fully implicit finite-difference model, whose time step is chosen solely to resolve accurately the physical flow of interest is discussed. The method is based on an operator factorization which reduces the dimensionality of the implicit approach: at each time step only (spatially) one-dimensional block-tridiagonal linear systems must be solved. The scheme uses two time levels and is second-order accurate in time. Compact implicit spatial differences are used, yielding fourth-order accuracy both vertically and horizontally. In addition, the development of a fully interactive computer code is discussed. With this code the user will have a choice of models, with various levels of accuracy and sophistication, which are imbedded, as subsets of the fully implicit 3D code. M.G.

N85-14409*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

INTERANNUAL VARIABILITY IN THE OBSERVED CIRCULATION

Glenn H. White *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 220-221 (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

An observational study of the relative roles of transient eddies and the time-mean flow in maintaining the momentum balance and in forcing vertical motion illuminated the role of time-mean secondary circulations forced by transient eddies. These secondary circulations transport westerly momentum from the upper to the lowr troposphere in the storm tracks, accelerating surface westerlies and making the time-mean flow more barotropic. An investigation of teleconnections in the Southern Hemisphere revealed a zonal wavenumber 3 pattern of low-frequency variability in the winterime midlatitudes and a land-ocean seesaw during summer. An observational comparison of the Northern Hemisphere winters found substantial differences in circulation patterns. The circulation changes may have been associated with substantial changes in low-frequency transient eddies in the Pacific, perhaps related to barotropic instability in the exit region of the Asian jet. Changes in the baroclinicity of the low-level flow appeared to be associated with changes in the storm tracks, while changes in the transient eddies appeared to play a minor role in interannual differences in the zonal momentum balance or in the forcing of vertical motion. M.G.

N85-14410*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LINEAR STUDIES OF STATIONARY, EXTRATROPICAL ANOMALIES IN THE TROPOSPHERE

J. L. Kinter, III *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 222-226 refs (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

The objectives, accomplishments, and future plans of a project to identify the full physical mechanism for the Pacific-North American variability are reported. Experiments with barotropic models incorporating topographic forcing are specifically discussed. M.G.

N85-14411*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MIXED LAYERS AND SATELLITE RETRIEVALS

R. Boers *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 227-230 (For primary document see N85-14360 05-47)

Avail: NTIS HC A11/MF A01 CSCL 04B

As part of the process to determine whether it is possible to retrieve boundary layer structure with the current sounding techniques, temperature retievals were performed for radiosonde profiles that showed temperature inversions. It was found that when temperature inversions exceed 8 to 10 C a retrieval will indeed show a temperature increase with height over a limited vertical distance. For weaker inversions retrieved temperatures are generally smoothly decreasing with height. It is, however, impossible to determine the actual mixed layer height from the retrievals. Whether the water vapor channels could be used in observing mixed layer structure was investigated. Temperature inversions are accompanied by significant drops in relative humidity. While this effect is very pronounced in parts of the trade wind regimes with relative humidity drops of up to 60%, it is widespread in other areas of the ocean as well. A simulation experiment was performed in which brightness temperatures were computed for smooth temperature and humidity profiles and compared with those computed from inversion profiles. M.G.

N85-14412*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE INFLUENCE OF SYNOPTIC SCALES ON LOW-FREQUENCY MODES OF VARIABILITY
S. D. Schubert *In its* Global Scale Atmospheric Processes Res. Program Review Nov. 1984 p 231-234 refs (For primary document see N85-14360 05-47)
Avail: NTIS HC A11/MF A01 CSCL 04B

Model analysis and predictablity studies using an equivalent barotropic empirical orthogonal function (EOF) model described in Schubert (1984b) are dicussed. An extensive set of 10-day forecasts was produced for the 12 component version of the model. Comparisons with observed data show apparently useful forecasts for individual winters. However, when averaged over 10 winters, the improvement over persistence was marginal and only one of the EOF's (resembling North Atlantic blocking) showed a statistically significant improvement. These results suggest the need for a more realistic model which includes shorter time scale baroclinic processes and spatial modes capable of efficiently representing the characteristic structures associated with baroclinic instability.
M.G.

N85-14413# World Climate Programme, Geneva (Switzerland).
REPORT OF THE MEETING OF EXPERTS ON CLIMATE AND HUMAN HEALTH
1983 114 p refs Meeting held in Geneva, 5-9 Dec. 1983 (WCP-78) Avail: NTIS MF A01; print copy available at WMO, Geneva

The need for an interdisciplinary approach to biometeorology is demonstrated with implications for WMO action. For individual titles, see N85-14414 through N85-14418.

N85-14414# World Climate Programme, Geneva (Switzerland).
ORGANIZATION OF THE SESSION
In its Rept. of the Meeting of Experts on Climate and Human Health 1983 20 p (For primary document see N85-14413 05-47)
Avail: NTIS MF A01; print copy available at WMO, Geneva

The diseases afflicting man in various climates are reviewed as well as those resulting from changes in the environment due to urbanization, industralization, and ecological disturbances such as efforestation and pollution. The need for educations scientists and professionals and of disseminating health information to the public is identified. Proposed draft plans for World Meteorological Organization action are established.
A.R.H.

N85-14415# World Climate Programme, Geneva (Switzerland).
INTRODUCTION TO HUMAN BIOMETEOROLOGY
W. H. Weihe *In its* Rept. of the Meeting of Experts on Climate and Human Health 1983 11 p (For primary document see N85-14413 05-47)
Avail: NTIS MF A01; print copy available at WMO, Geneva

Biometeorology comprises the study of the direct and indirect effects of the physical, chemical, and physiochemical micro and macroenvironments of both the Earth atmosphere, and similar extraterrestrial environments, on physical chemical systems and on living organisms in particular. An introduction to human biometeorology is presented to lay before the meteorologist the events of human life which are affected by the atmosphere.
A.R.H.

N85-14416# World Climate Programme, Geneva (Switzerland).
DIFFICULTIES ENCOUNTERED IN DETERMINING THE POTENTIAL INVOLVEMENT OF CONSULTANTS ON HEALTH PROBLEMS IN VARIOUS CLIMATIC ZONES
A. E. Martin *In its* Rept. of the Meeting of Experts on Climate and Human Health 1983 5 p refs (For primary document see N85-14413 05-47)
Avail: NTIS MF A01; print copy available at WMO, Geneva

Examination of the literature on human biometeorology indicates that most research was conducted either on the physiological effects of different types of climate, or on the relationship between various medical conditions and meteorological factors. Research on the latter has inevitably encountered the difficulties, common to many epidemiological studies, of identifying causes and effects, and of assessing the relative importance of various etiological cofactors. Such difficulties hamper the development of biometeorology as a science. The role of the community physician or his counterpart in preventive medicine is a pivotal figure in assessing the prevalence of diseases and determining measures needed to deal with them. Hyperthermia, respiratory, and cardiac diseases occur in all climates.
A.R.H.

N85-14417# World Climate Programme, Geneva (Switzerland).
REVIEW ON PHYSIOLOGICAL AND MEDICAL PROBLEMS RELATED TO CLIMATES RANGING FROM ALTITUDE TO SUB-TROPICS
W. Selvamurthy *In its* Rept. of the Meeting of Experts on Climate and Human Health 1983 3 p (For primary document see N85-14413 05-47)
Avail: NTIS MF A01; print copy available at WMO, Geneva

Because of the diversity of climates in different parts of the country, India presents an interesting zone in the globe for the study of the effect of climates on human health and on human efficiency. The neurophysiological basis of altitude acclimatization and maladaptation were studied. The hot humid climate of the coastal belts presents many medical problems in addition to the physiological effects. Rapid industrialization, deforestation, and ecological disturbance due to urbanization and environmental pollution are changing the natural climate and posing addition health problems. Suggestions for research in these areas are included.
B.G.

N85-14418# World Climate Programme, Geneva (Switzerland).
EPIDEMIOLOGIC METHODS APPLIED TO THE STUDY OF THE RELATIONSHIP BETWEEN CLIMATE AND HUMAN HEALTH
Inge F. Goldstein *In its* Rept. of the Meeting of Experts on Climate and Human Health 1983 21 p (For primary document see N85-14413 05-47)
Avail: NTIS MF A01; print copy available at WMO, Geneva

It has long been recognized that a number of diseases are closely associated with climate or meteological conditions. These relationships show up in both spatial and temporal forms. Certain diseases are known only in certain geographic regions demarked by distinct climatic patterns. Among the factors central to the epidemiological investigation and understanding of any disease or condition is its temporal variation. Striking periodicity in the distribution of the disease, whether daily, weekly, monthly or seasonal, warrants further research and often reveals an otherwise obscure etiology. Evidence for a relation between a disease and a particular climatic or meteorological condition is most often initially established by statistical methods using correlation or regression techniques. These methods applied to the study of climate and human health lead to establishment of the relationship between the two.
B.G.

N85-14419# Sandia Labs., Albuquerque, N. Mex.
A NEW PHYSICAL LAGRANGIAN TRACER
B. D. Zak 1984 5 p refs Presented at the Atmospheric Tracer Workshop, Santa Fe, N. Mex., 21-25 May 1984 Submitted for publication
(Contract DE-AC04-76DP-00789)
(DE84-016212; SAND-84-1701C) Avail: NTIS HC A02/MF A01

A physical Lagrangian tracer will be operational and available for use within the near future. The tracer is an adjustable buoyancy constant volume balloon with an onboard microprocessor to serve an appropriate array of sensors, and to control buoyancy. Tracking and data reporting is to be accomplished via the ARGOS satellite-borne data system yielding both a local and a world-wide capability.
DOE

N85-14420# Amt fuer Wehrgeophysik, Traben-Trarbach (West Germany).
TAF VERIFICATION (AIRPORT WEATHER FORECASTS) [TAF-VERIFIKATION]
Harald Weingaertner Jul. 1984 39 p In GERMAN
(GeophysBDBw-FM-205; ISSN-0342-6025) Avail: NTIS

HC A03/MF A01

An airport weather forecast (TAF) verification procedure is described and the results for 42 airfields are presented. The TAF is verified with regard to horizontal visibility, the parameters being summarized in color-state classes. The quota for correct TAF is 73%. Scientific forecast performance is 62%, showing an exponential decrease from 76% (1st hour) to 49% (9th hour).

Author (ESA)

N85-14421# National Academy of Sciences - National Research Council, Washington, D. C.

POLAR REGIONS AND CLIMATIC CHANGE

1984 74 p refs Sponsored by Andrew W. Mellon Foundation, ONR, NOAA, and DOE

(PB84-237023) Avail: NTIS HC A04/MF A01 CSCL 04B

The state of knowledge about polar processes in global climate dynamics, identifying research needs, and recommending directions for future research were reviewed. The implications of predicted climatic changes which result from increasing levels of atmospheric carbon dioxide for the stability of the polar ice sheets are emphasized. The Committee's findings, conclusions and recommendations are reported. GRA

N85-14185*# Stockholm Univ. (Sweden).

GLOBAL BIOGEOCHEMICAL CYCLES: STUDIES OF INTERACTION AND CHANGE, SOME VIEWS ON THE STRATEGY OF APPROACH

B. Bolin *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 25-54 refs (For primary document see N85-14183 05-42)

Avail: NTIS HC A12/MF A01 CSCL 04B

N85-14186*# Oak Ridge National Lab., Tenn.

SOME ASPECTS OF UNDERSTANDING CHANGES IN THE GLOBAL CARBON CYCLE

W. R. Emanuel, B. Moore (New Hampshire Univ., Durham), and H. H. Shugart *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 55-84 refs (For primary document see N85-14183 05-42)

Avail: NTIS HC A12/MF A01 CSCL 04B

N85-14253 Deutscher Wetterdienst, Hamburg (West Germany).

GLOBAL RADIATION IN WEST GERMANY [GLOBALSTRAHLUNG IN DEUTSCHLAND EIN KURZER UEBEBLICK]

Fritz Kasten *In* Fachinformationszentrum fuer Energie, Phys., Math. GmbH Inform. Package on Photovoltaics Sep. 1983 p 23-28 refs In GERMAN (For primary document see N85-14250 05-44)

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48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-14422 Stanford Univ., Calif.

OCEANIC PLATEAUS, ANOMALOUS SUBDUCTION, AND THE ACCRETION OF BUOYANT FEATURES AT CONVERGENT MARGINS Ph.D. Thesis

Susan Emily McGeary 1984 133 p

Avail: Univ. Microfilms Order No. DA8420590

The subduction of oceanic lithosphere at convergent margins is discussed. The presence of a large, anomalously buoyant feature within the subducting slab can significantly modify the processes associated with subduction. In particular, the subduction of such a feature can change the geometry of the subduction system, modify the distribution of earthquakes, and create spatial gaps in linear volcanic chains. If the feature is buoyant enough, it may resist subduction completely and collide with the convergent margin. As a result of the collision, subduction may stop or slow down and local plate boundaries may reorganize to accommodate continuing convergence. There are over 100 such bathymetrically anomalous features, known as oceanic plateaus or aseismic ridges within the oceans today. The Aves Ridge in the eastern Caribbean Ocean is an example of such a feature. Multichannel seismic reflection data and gravity modeling show the ridge to be over 30 km thick, with a detailed crustal structure intermediate in velocity between normal oceanic crust and continental crust.

Dissert. Abstr.

N85-14423# Geological Survey, Washington, D.C.

THE GEORGES BANK MONITORING PROGRAM 1983: ANALYSIS OF TRACE METALS IN BOTTOM SEDIMENTS

M. H. Bothner, R. R. Rendigs, Esma Campbell, M. W. Doughten, P. J. Aruscavage, A. F. Dorrzapf, Jr., R. G. Johnson, C. M. Parmenter, M. J. Pickering, and D. C. Brewster 1984 40 p refs Sponsored in cooperation with US Minerals Management Service (CIRC-915) Avail: NTIS HC A03/MF A01

From July 1981, when drilling began on Georges Bank, to May 1982, the concentration of barium, a major element in drilling mud, has increased by a factor of 3.5 in bulk sediments 200 m from the drift site in block 410 and by a factor of 2.5 at the drill site in block 312. The postdrilling barium concentrations are within the range of predrilling concentrations measured at other locations on Georges Bank. It is that no more than 21 percent of the barite (principal barium bearing mineral) discharged during drilling remains within 6 km of the drill site in block 312. The chemical signal of drilling mud in surficial sediments has been enhanced by separating and analyzing the sediment fraction finer than 60 m. Barium concentrations in the fine fraction have increased by factors of 36 and 22 at the drill sites in blocks 410 and 312, respectively. The concentrations of aluminum, barium, cadmium, chromium, copper, iron, lead, manganese, mercury,, nickel, organic carbon, vanadium, and zinc in surface sediments of Georges Bank both before and after drilling are low compared to concentration in average crutal rocks. B.W.

N85-14190*# Florida State Univ., Tallahassee. Dept. of Oceanography

INTERACTIONS OF THE MARINE PHOSPHORUS AND CARBON CYCLES

P. N. Froelich *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 141-178 refs (For primary document see N85-14183 05-42)

Avail: NTIS HC A12/MF A01 CSCL 08C

N85-14193*# Scripps Institution of Oceanography, San Diego, Calif.

RECENT STUDIES OF THE OCEAN NITROGEN CYCLE

R. W. Eppley *In* JPL The interaction of Global Biochemical Cycles 15 Jan. 1984 p 219-228 refs (For primary document see N85-14183 05-42)

Avail: NTIS HC A12/MF A01 CSCL 08C

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-14424 Harvard Univ., Cambridge, Mass.

OXYGEN DELIVERY DURING EXERCISE: LIMITATIONS TO MAXIMUM FLOW Ph.D. Thesis

Richard H. Karas 1984 154 p

Avail: Univ. Microfilms Order No. DA8419451

A comparative approach has been utilized to address questions of system limitations to maximal rates of oxygen flow during exercise. By combining structural and functional measurements, a mechanistic analysis was performed of factors involved in transporting oxygen from the lungs to the working muscle in four species of animals at exercise intensities ranging from standing quietly on the treadmill to running at speeds which elicit maximum oxygen consumptions. The four species of animals chosen for study (Dogs, Goats, Ponies and Cattle) represent two size classes. One member of each size class is highly specialized for aerobic work and one member is not. It was found that animals increase the delivery of oxygen with increasing exercise intensity primarily by increasing

cardiac output (due to an increase in heart rate and a decrease in total peripheral resistance) and that the highly aerobic animals have higher maximal rates of oxygen delivery by virtue of their relatively higher cardiac outputs (due to larger stroke volume) and their higher hematocrits. Dissert. Abstr.

N85-14425# European Space Agency, Paris (France).
LIFE SCIENCES RESEARCH IN SPACE
Norman Longdon, comp. and Olga Melita, comp. Aug. 1984 307 p refs Partly in ENGLISH and FRENCH Proc. of 2nd European Symp., Porz Wahn, West Germany, 4-6 Jun. 1984
(ESA-SP-212; ISSN-0379-6566) Avail: NTIS HC A14/MF A01

Spaceborne research in cell and developmental biology; plant biology bioprocessing radiobiology cardiovascular/respiratory system musculoskeletal systems vestibular and sensorimotor systems and body fluid metabolisms was discussed. For individual titles, see N85-14426 through N85-14477.

N85-14426# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
SPACELAB MISSION D1 FROG STATOLITH EXPERIMENT STATEX: HARDWARE FAMILY AND EXPERIMENT OPERATIONAL SEQUENCE
J. Neubert, A. Schatz, and W. Briegleb *In* ESA Life Sci. Res. in Space Aug. 1984 p 9-12 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The sample container, stowage locker insert, and temperature chamber of the Spacelab Frog Statolith Experiment (STATEX) are described. The experiment studies the differentiation and morphology of vertebrate gravity sensory organs in near weightlessness with frog embryos and tadpoles. The sample container has a 40 to 60% O2/N2 atmosphere with 100% humidity and a centrifuge. After the experiment the container is cooled to 10 C, to slow down specimen metabolism in the stowage locker. The temperature chamber maintains the samples at 20 C for the 160 hr of the experiments, using a system based on Peletier elements. The STATEX hardware can be used for non-biology experiments, e.g., in fluid physics. Author (ESA)

N85-14427# Hubrecht Lab., Utrecht (Netherlands).
AN AUTOMATIC DEVICE FOR AMPHIBIAN EGG FERTILIZATION IN SPACE: TECHNICAL ASPECTS AND BIOLOGICAL REQUIREMENTS
T. G. Brom, G. A. Ubbels, and H. P. Willemsen (Centrum voor Constructie en Mechanisatie, Nuenen, Netherlands) *In* ESA Life Sci. Res. in Space Aug. 1984 p 13-17 refs Sponsored by Netherlands Agency for Aerospace Programs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

An experiment container for Xenopus laevis testes and eggs was developed for a Spacelab experiment to investigate whether amphibian eggs can be fertilized under microgravity conditions; and to investigate the role of gravity in the establishment of the dorso-ventral axis in the developing embryo. Testes and eggs are kept separate for 18 to 22 hr until the start of the experiment. Fertilization and embryonic development take place in the container. The mechanical functions of the automatic container are discussed, as well as the internal conditions important for the biological material, such as biocompatibility of the materials, composition of storage and culture media, temperature, osmolarity, and pH. Author (ESA)

N85-14428# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Biochemie.
EXPERIMENT 1ES031 ON SPACELAB 1: ARE CELLS SENSITIVE TO GRAVITY?
Augusto Cogoli, Alex Tschopp, and Pia Fuchs-Bislin *In* ESA Life Sci. Res. in Space Aug. 1984 p 19-22 refs Sponsored by Federal Swiss Institutes of Technology Board (For primary document see N85-14425 05-51)
(Grant SNSF-3.034-81)
Avail: NTIS HC A14/MF A01

Cultures of human lymphocytes were exposed in microgravity to the mitogen concanavalin A. They show an activation < 3% that of ground controls. This result favors a hypothesis, based on simulations at low-g and on experiments at high-g, that microgravity depresses, whereas high-g's enhance cell proliferation rate. The g-effects are particularly strong in cells undergoing differentiation. Author (ESA)

N85-14429# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
FURTHER CELL BIOLOGY EXPERIMENTS WITH PHYSARUM POLYCEPHALUM FOR A REFLIGHT OF BIORACK
V. Sobick *In* ESA Life Sci. Res. in Space Aug. 1984 p 23-25 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The scientific background, hardware, and operational flow of ESA-Biorack experiment A08/16/D Physarum Kinetics are described. Experiments on the spatial organization, assembly, and disassembly of atomyosin fibrils responsible for the contraction and movement of the slime mold on acceleration effects on mitosis and on the nuclear orientation within the Physarum cell are proposed. Author (ESA)

N85-14430# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
INFLUENCE OF SIMULATED WEIGHTLESSNESS ON THE MOTILITY OF THE ACELLULAR SLIME MOLD PHYSARUM POLYCEPHALUM
I. Block, W. Briegleb, and K.-E. Wolfarth-Bottermann (Bonn Univ.) *In* ESA Life Sci. Res. in Space Aug. 1984 p 27-30 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The gravisensitivity of single cells not specialized for the reception of gravity was studied under simulated weightlessness, using slime mold. When simulating 0 g on the fast rotating clinostat, a transient frequency increase in oscillating contraction automaticity and the cytoplasmic shuttle streaming is observed. Changes are also seen in the velocity of the cytoplasmic shuttle streaming. About 20 min after the onset of 0 g the slime mold starts to regulate most of these parameters back to normal values, which is achieved at the earliest 40 min after the beginning of the 0 g-simulation. During this time the velocity of the shuttle streaming is increasing. Stopping the rotation again induces strong reactions, the most prominent of which is a strong decrease in the velocity of the shuttle streaming. Author (ESA)

N85-14431# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
OBSERVATION OF THE CONTRACTILE VACUOLAR SYSTEM OF PARAMECIUM CAUDATUM ON THE FAST RUNNING CLINOSTAT
R. Hemmersbach, W. Briegleb, and A. Schatz *In* ESA Life Sci. Res. in Space Aug. 1984 p 31-34 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The generality of gravisensitivity in cells was examined by observing the behavior of the contractile vacuolar system of Paramecium caudatum under 1g, then under simulated weightlessness, and again under 1g. The paramecia were mounted between two glass slides using a modified agar method. Only 64% of the 22 measured vacuoles change their respective behavior under simulated 0g. Author (ESA)

N85-14432# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
SPONTANEOUS MOTILITY OF GOLDFISH IN ABSENCE OF TERRESTRIAL ZEITGEBERS: SPACE FLIGHT SIMULATION IN A MINE

D. Seibt *In* ESA Life Sci. Res. in Space Aug. 1984 p 35-40 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The reaction of organisms to the absence of zeitgebers was studied in long term experiments with goldfish in a mine with excellent shielding against natural zeitgeber cycles. Patterns in which the circadian organization is partly obscured or not detectable at all are obtained. The patterns are described as a random sequence resulting from stochastic decisions. The implications and methodological problems of this approach are discussed. Author (ESA)

N85-14433# Paris VI Univ. (France). Lab. de Cytologie et Morphogenese Vegetales.
GRAVITY AND CELL DIFFERENTIATION IN LENTIL ROOTS
Gerald Perbal and Nicole Darbelley *In* ESA Life Sci. Res. in Space Aug. 1984 p 43-46 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The localization of the functional zones of the root tip (meristem, cell elongation zone, zone of gravitropic curvature) was studied in lentil seedlings. Results show that target cells which react to a 2 hr gravitropic stimulus are located in the distal part of the meristem and in the proximal region of the cell elongation zone. It is shown that the gravitropic curvature occurs in the distal part of the meristem because of early differentiation of the cells in its upper half. In the proximal part of the cell elongation zone, bending occurs because of an inhibition of cell growth in the lower half of the horizontally simulated roots. Mitotic activity and cell differentiation in the primary root can be partly regulated by the mechanism responsible for gravitropic response. Author (ESA)

N85-14434# Aarhus Univ. (Denmark). Inst. of Molecular Biology and Plant Physiology.
PLANT CELL CULTURES IN BIOLOGICAL SPACE EXPERIMENTS
O. S. Rasmussen, J. Christiansen, R. Wyndaele, and T.-H. Iversen (Trondheim Univ., Norway) *In* ESA Life Sci. Res. in Space Aug. 1984 p 49-51 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Microgravity environment influences on growth and differentiation and regeneration of tobacco protoplasts and callus tissue were studied. Protoplasts from leaves of Nicotiana sanderae, cv Crimson Bedder were isolated. Aliquote samples were placed in the horizontal axis of a slow or a fast rotating clinostat. After 2, 4, or 6 hr protoplasts are transferred to small petri dishes with nutrient medium. Regeneration of cell walls started after 1 to 3 days and is followed by cell division. In order to induce a delay in growth and differentiation of callus tissue, samples were cooled to 6 and 10 C for 5 weeks, considerably reducing growth. Author (ESA)

N85-14435# Trondheim Univ. (Norway). Dept. of Botany.
THE USE OF HORIZONTAL CLINOSTATS IN STUDIES OF PLANT STATOCYTE DEVELOPMENT
G. Slupphaug and T.-H. Iversen *In* ESA Life Sci. Res. in Space Aug. 1984 p 53-59 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The effect of variations in rotation (2rpm and 50rpm) on growth, gravitropic curvatures, and the ultrastructure of the gravity perceiving cells (statocytes) in cress roots was examined. Growth and gravitropic curvatures in previously stimulated roots are higher after rotation on the fast clinostat. After 20 hr rotation of 24 hr old seedlings on both clinostats, the amyloplasts are found scattered around in the statocytes, the amount of statolith starch decreases in the functional statocytes, and the distal ER-complex disintegrates. The effect is most marked after rotation at 2rpm. Rotation at 2rpm influences cell wall morphology. Author (ESA)

N85-14436# Freiburg Univ. (West Germany). Inst. fuer Biologisches 2.
PLANT RESPONSES TO SOLAR UV-B RADIATION
E. Wellmann, C. J. Beggs, B. Moehle, U. Schneider-Ziebert, and V. Steinmetz *In* ESA Life Sci. Res. in Space Aug. 1984 p 61-66 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Effects on plants of increased solar UV-B due to reduction of the stratospheric ozone layer are reviewed together with protective systems to minimize damage. Screening, growth delay, DNA repair mechanisms, and protection against free radical species are discussed and their occurrence in plants considered. The importance of UV radiation in natural plant morphogenesis is underlined. Author (ESA)

N85-14437# Universitaire Instelling Antwerpen, Wilrijk (Belgium). Dept. of Biology.
TIMING IN DRY SEEDS
J.-P. Verbelen, E. Spruyt, and J. A. DeGreef *In* ESA Life Sci. Res. in Space Aug. 1984 p 67-72 refs Sponsored by NFWO (For primary document see N85-14425 05-51)
(Grant FKFO-2.0083.83)
Avail: NTIS HC A14/MF A01

Laboratory experiments proved a rhythmic behavior in growth parameters of etiolated bean seedlings grown in strictly constant conditions. The rhythms are endogenous and the shape of the activity curves cannot be altered by changing the moment of sowing. The ATP-synthesis rate and germination vigor were compared as a function of the moment of the onset inhibition. For both parameters oscillations with a period approximately equal to that of the activity curves obtained for the parameters formerly studied are recorded. The involvement of environmental factors in the learning and the maintenance of this rhythm is discussed. Author (ESA)

N85-14438# Nijmegen Univ. (Netherlands). Dept. of Biochemistry.
BIOPROCESSING IN SPACE
Sjoerd L. Bonting *In* ESA Life Sci. Res. in Space Aug. 1984 p 75-78 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The technical, biological, and financial aspects of bioprocessing medical products in space using continuous free-flow electrophoresis (CFE) are discussed. Specifications for a CFE apparatus are suggested. Candidate materials, e.g., erythropoietin for anemia and pancreas beta cells for diabetes, are listed. Author (ESA)

N85-14439*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BIOPROCESSING IN SPACE
A. Tschopp, A. Cogoli, M. L. Lewis, and D. R. Morrison *In* ESA Life Sci. Res. in Space Aug. 1984 p 79-81 refs Prepared in cooperation with Eidgenoessische Technische Hochschule, Zurich (For primary document see N85-14425 05-51)
(Grant SNSF-3.034-81)
Avail: NTIS HC A14/MF A01

Attachment to a substrate and survival of human embryonic kidney cells (HEK) was tested in an incubator installed in the flight-deck of the space shuttle Challenger. The HEK cells produce the enzyme urokinase and are candidates for electrophoretic separation. Attachment of the cells to a substrate is mandatory for survival. Analysis of the samples shows that cells adhere, spread and survive in 0 g conditions as well as the ground controls at 1 g. Author (ESA)

N85-14440# Marburg Univ. (West Germany). Klinik und Poliklinik fuer Nuklearmedizin.
RADIOBIOLOGICAL STUDIES ON EGG SYSTEMS EXPOSED TO HEAVY NUCLEI OF COSMIC GALACTIC RADIATION
E. H. Graul, W. Ruether, and H. Hoeffken *In* ESA Life Sci. Res. in Space Aug. 1984 p 87-93 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The influence of space flight environment, especially HZE-particles (particles with high charge z and energy loss) of cosmic radiation was studied in the eggs of Artemia salina, the brine shrimp Tribolium confusum, the flour beetle, and Carausius morosus

the stick insect. In Artemia and Tribolium, passage of each single heavy ion through a mosaic blastula egg, without regeneration, damages an area large enough to disturb either embryogenesis or further development of the larva, or the integrity of the adult individual. Reduced vitality is observed in the flight control group. In Carausius, highest damage rate occurs 25 days after oviposition, when the extremities and head antennae are formed. Morphological damage results from irradiation at later stages, but the particles do not penetrate the whole egg. Author (ESA)

N85-14441# Johann-Wolfgang-Goethe-Univ., Frankfurt am Main (West Germany). Inst. fuer Botanisches.

PRELIMINARY RESULTS OF ADVANCED BIOSTACK EXPERIMENTS WITH PLANT SEEDS AND SPORES

A. R. Kranz *In* ESA Life Sci. Res. in Space Aug. 1984 p 95-98 refs (For primary document see N85-14425 05-51)
(Grant BMFT-1-ES-027)
Avail: NTIS HC A14/MF A01

A Spacelab Biostack experiment on dosimetry of cosmic rays at different positions in the space shuttle determination of the biological effectiveness of individual HZE-particles, and registration of interactions with other environmental factors are introduced. Plant investigations are used to improve track and hit analysis in monocellular spores and multicellular seeds of eukaryotic plants to determine radiobiological inactivation induced by HZE-tracks and HZE-fission stars and to indicate early and late biological damage in somatic and genetic effective cells. Biological objects are sandwiched between nuclear track detectors of varying sensitivity against cosmic heavy ions. Applying computerized microscopy, the energy deposition of individual ions in single cells of embryonic seed tissues and in spore cells is estimated precisely. Investigation of early and late developmental damage, chromosome aberrations, and gene mutations in ground control, backup, and flight units verifies the somatic and genetic effectiveness of heavy ions in space. Author (ESA)

N85-14442# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.

THE RADIOBIOLOGICAL ADVANCED BIOSTACK EXPERIMENT ON SPACELAB 1

H. Buecker, G. Horneck, J. U. Schott, G. Reitz, M. Schaefer, and R. Facius *In* ESA Life Sci. Res. in Space Aug. 1984 p 99-103 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

A project to investigate the radiobiological properties of the heavy ions of cosmic radiation in order to acces their significance for radiation protection standards in manned spaceflight is outlined. Radiation tests were carried out on insect eggs and plastic detectors. Evaluations of the physical and biological subsystems indicate that the experimental material endured the space flight satisfactorily. Author (ESA)

N85-14443# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Biophysics Div.

SPACELAB 1 EXPERIMENT: MICROORGANISMS IN SPACE HARD ENVIRONMENT

G. Horneck, H. Buecker, G. Reitz, H. Requardt, K. Dose (Mainz Univ., West Germany), K. D. Martens (Mainz Univ.), A. Bieger (Mainz Univ.), H. D. Mennigmann (Frankfurt Univ.), and P. Weber (Frankfurt Univ.) *In* ESA Life Sci. Res. in Space Aug. 1984 p 105-110 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

A Spacelab experiment to determine the response of a resistant microbial system to free space and to selected components of the environment is described. An exposure tray was mounted on the pallet, with 316 dry samples of B. subtilis spores. Post-flight analyses include studies of survival, growth delay, mutation induction, reparability of UV damage, and photochemical changes in DNA and protein. Exposure to space vacuum reduces viability counts to 50%, increases mutation frequencies by a factor of 10, and produces cross-linking between DNA and proteins. Space vacuum and solar UV irradiation act synergistically in inactivation. The photoproducts isolated from DNA and protein of spores exposed to solar UV and vacuum, differ quantitatively and qualitatively from those produced by solar UV at 1 bar. Author (ESA)

N85-14444# Society for Phytotechnology, Vienna (Austria).

PLANT GROWTH IN SPACE

Othmar Ruthner *In* ESA Life Sci. Res. in Space Aug. 1984 p 111-115 (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Phytotechnological methods to safeguard the viability of spaceborne human beings and animals are discussed. Plants can be used for the generation of energy through special plants for the production of biomass in transparent growth rooms and for the production of human and animal food in gas and light-tight growth chambers, using Ruthner plant production systems based on plant and light lattices. Author (ESA)

N85-14445# Tours Univ. (France). Lab. de Biophysique.

ULTRASONIC STUDY OF EARLY CARDIOVASCULAR ADAPTATION TO ZERO GRAVITY c52

L. Pourcelot, Ph. Arbeille, J. M. Pottier, F. Patat, P. Mignier, A. Guell (Service de Neurologie, Toulouse), and C. Gharib (Universite C. Bernard, Lyon) *In* ESA Life Sci. Res. in Space Aug. 1984 p 119-123 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Cardiovascular examination was performed on 1 subject in microgravity aboard Salyut 7. An ultrasound measuring system was developed. Cardiac output, heart rate, stroke volume, and left ventricle diameters increase. Stability of myocardial contractility, disturbances in venous flow and vascular compliance, changes in peripheral resistance, and good autoregulation of the cerebral blood flow are noted. The increase of the cardiac output without major modification of the cerebral and femoral flows suggests that renal and/or the hepato-digestive circulation increases during microgravity exposure. The great modifications of the venous return requires a better study of the flow in the vena cava. Author (ESA)

N85-14446# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.

LEFT HEART VENTRICULAR FUNCTION DURING A 7 DAY ZERO-G SIMULATION (6 DEG HEAD DOWN TILT) c52

F. Baisch and L. Beck *In* ESA Life Sci. Res. in Space Aug. 1984 p 125-132 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Ultrasound measurements of cardiac dimensions were performed on 12 volunteers during a 7 day 6 deg head down tilt (HDT) 0-g simulation. From the uniform increase in left ventricle dimensions in the remobilization phase, it is deduced that a shift in the contractile state of the left ventricle takes place during the HDT bedrest period. To noninvasively quantify this contractile change, ventricle function curves obtained by reducing preload in an LBNP maneuver are proposed. The high correlation coefficients between pre ejection period /dp/dt max and between left ventricular ejection time/sv in animal experiments under different contractile states validate this proposal. Author (ESA)

N85-14447# Rome Univ. (Italy). Postgraduate School of Aerospace Medicine.

THREE-DIMENSIONAL BALLISTOCARDIOGRAPHY IN WEIGHTLESSNESS (EXPERIMENT 1ES 028) c52

A. Scano, Eduardo Rispoli, Felice Strollo, Giorgo Brazzoduro, Franco Prandi, and Giovanni Cama *In* ESA Life Sci. Res. in Space Aug. 1984 p 133-139 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

A technique for recording triaxial ballistocardiographs (BCG) and electrocardiographs in microgravity was developed. Analysis of tracings shows the overall amplitude increase in microgravity of BCG-Z systolic waves (longitudinal) and the variation of the

ratio of their dimensions which makes the tracing M-shaped; BCG-Y (transversal) shows modifications less constant than the previous ones. Therefore microgravity clearly affects the BCG, and its effects continue for over 6 days after re-entry. Author (ESA)

N85-14448# Clinical Research Centre, London (England).
MINIATURE PERSONAL PHYSIOLOGICAL TAPE RECORDER (EXPERIMENT 1ES 30) **c52**
H. L. Green, F. D. Stott, and O. Petre-Quadens (Univ. Instelling Antwerpen, Belgium) *In* ESA Life Sci. Res. in Space Aug. 1984 p 141-144 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

A miniature 24 hr tape recorder was used to record electrocardiograph (ECG), electro-oculogram (EOG) and electroencephalogram (EEG) data, during the first Spacelab mission to start a data base on the payload specialists who are primarily scientists with no test pilot experience. The second objective was to prove the feasibility of a working scientist wearing the equipment without it reducing his normal mobility and activity. Analysis of ECG recordings do not show any significant differences in flight compared with those obtained on normal subjects on the ground. The wearing of the recorder and ECG electrodes causes no inconvenience but the EOG wires can be a nuisance. Considerable difficulty was experienced with the EEG electrodes, resulting in limited data being obtained. Author (ESA)

N85-14449# Copenhagen Univ. (Denmark). Lab. of Human Physiology.
CARDIAC OUTPUT MEASURED BY MASS SPECTROSCOPY **c52**
F. Bonde-Petersen *In* ESA Life Sci. Res. in Space Aug. 1984 p 145-148 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Cardiac output for a subject rebreathing a mixture of oxygen, argon and acetylene from a rubber bag fitted with a three-way stopcock and a mouthpiece was measured. Argon was used to assess volume and mixing problems. As acetylene dissolves physically in blood, its disappearance rate is flow limited, i.e., it is a measure of the lung capillary flow and hence the cardiac output. Freon-22 can also be used as the soluble gas, and if carbon monoxide is added the diffusion capacity for CO can be calculated. Lung tissue blood volume can be calculated from the differences between argon distribution and that of the soluble gas. Oxygen consumption is calculated from the disappearance rate of oxygen. Author (ESA)

N85-14450# Karolinska Inst., Stockholm (Sweden). Dept. of Medical Engineering.
CARDIAC OUTPUT MEASUREMENT WITH SOLUBLE GASES **c52**
Dag Linnarsson and Hans Larsson *In* ESA Life Sci. Res. in Space Aug. 1984 p 149-150 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

A method for selective rebreathing is presented and its application to pulmonary blood flow determination in patients is shown. Twenty-two patients with valvular heart disease were studied during rest and light exercise in the supine position. Comparison with an invasive reference method show good correlation between the invasive and the rebreathing methods. However, a systematic deviation which could be related to the nonideal ventilation-perfusion relationships in the lungs of the patients is found. Author (ESA)

N85-14451# Deutsche Sporthochschule, Cologne (West Germany).
PHYSICAL PERFORMANCE CAPACITY AFTER A 7 DAY HEAD-DOWN TILT (-6 DEG) **c52**
J. Stegemann, D. Essfeld, and U. Hoffmann *In* ESA Life Sci. Res. in Space Aug. 1984 p 151-157 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Physical performance capacity in 6 healthy male subjects before and on the 1st and 7th day after a continuous 7-day head-down tilt was studied. Pseudo-random binary sequences (PRBS) of work load were used as testing signals during upright bicycle ergometer exercise. From the PRBS tests, the frequency responses of oxygen uptake (V'O2) and heart rate were computed at 9 harmonic frequencies (fundamental frequency: 0,0135 rad/sec). After the simulated weightlessness, the V'O2 kinetics is found to be impaired at harmonic frequencies above 0.068 rad/sec. Author (ESA)

N85-14452# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
LEG VOLUME CHANGES. RESPONSES TO LOWER BODY NEGATIVE PRESSURE (LBNP) DURING 7 DAYS OF ZERO-G SIMULATION (6 DEG HEAD-DOWN TILT (HDT)) **c52**
E. W. Mueller, H. Hohlweck, G. Plath, and F. Baisch *In* ESA Life Sci. Res. in Space Aug. 1984 p 159-162 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

During a 7 day 0-g simulation via 6 deg head down tilt, lower body negative pressure experiments were done. Leg volume was determined with an ultrasound plethysmography equipment. During the phase of plasma volume reduction leg tissue stiffness increases. The method can measure leg volume changes simultaneously at several positions. With LBNP or occlusion cuffs, the lower extremities can be tested dynamically. Changes of compliance can be assessed. Since it is possible to leave the light weight transducers on the leg for >1 day the accuracy of the method may be improved, to follow the time course of leg volume changes. This would be useful in spaceflight for determination of the absolute volume shift during launch and landing. Author (ESA)

N85-14453# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
HEART RATE VARIABILITY DURING 7 DAY HEAD-DOWN TILT (6 DEG) **c52**
A. Samel and F. Baisch *In* ESA Life Sci. Res. in Space Aug. 1984 p 163-167 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Heart rate variability, body temperature, and changes in the excretion rates of hormones during simulation of weightlessness over 7 days were measured. Peak to peak intervals of heart rate show a significant increase on the first day of simulation and a significant decrease on the first 2 days after simulation. The excretion of hormones alters distinctly during the simulation period. It is concluded that these alterations are induced by parasympathetic activities. Author (ESA)

N85-14454# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
COMPARISON OF SIMULATION OF WEIGHTLESSNESS BY HEAD DOWN TILT (HDT) AND WATER IMMERSION (WI) **c52**
H. Loellgen (Medical Clinic St. Vincenz-Hospital, Limburg, West Germany), K. E. Klein, J. Beier, J. R. Hordinsky, F. Baisch, G. vonNieding (Federal Bureau of Health, Berlin), and H. Just (Freiburg Univ., West Germany) *In* ESA Life Sci. Res. in Space Aug. 1984 p 169-174 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

During 6 deg head down tilt (HDT) and water immersion (WI) central hemodynamics was analyzed by a semifloating pulmonary artery catheter in a group of volunteers. Echocardiography (HDT) and radionuclide angiography (WI) were also performed. During WI, cardiac and stroke volume index increase, but remain constant during HDT; right heart pressures are more elevated during WI than during HDT. Ejection fraction is constant during HDT but rises during WI depending on the depth of immersion. The HDT seems to be more appropriate to simulate microgravity. Echocar-

diography should be applied in space and invasive measurements are also possible. Author (ESA)

N85-14455# Hamburg Univ. (West Germany). Dept. of Ophthalmology.
INTRAOCULAR FLUID DYNAMICS IN MICROGRAVITY c52
J. Draeger, K. Hanke, R. Berger, and E. Rumberger *In* ESA Life Sci. Res. in Space Aug. 1984 p 175-177 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Alterations in systemic circulation due to fluid shift in microgravity, which raise intraocular pressure (IOP) were simulated by head down tilt. Series of tonometry were performed using a handheld applanation tonometer: (1) short time postural change up to -90 deg head down and back; (2) tonometry in -10 deg head down over 2 hr.; (3) repetition of 2 after dehydration of the patients; (4) two 7-day bedrest studies in -6 deg head down tilt; (5) tonometry during lower body negative pressure; and (6) tonometry during Valsalva-maneuver. Immediately on tilting, the IOP changes with hydrostatic pressure. After 1 hr the raised IOP returns to normal. The IOP seems to change parallel to venous pressure.
Author (ESA)

N85-14456# Graz Univ. (Austria). Inst. fuer Physiologisches.
MEASUREMENT OF BLOOD AND PLASMA DENSITY WITH THE MECHANICAL OSCILLATOR TECHNIQUE c52
T. Kenner and H. Hinghofer-Szalkay *In* ESA Life Sci. Res. in Space Aug. 1984 p 179-182 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The mechanical oscillator technique to determine mass and density of test fluids in the absence of gravity is described. The technique is based on the determination of the autooscillation frequency of a mass-spring system. The mass of the oscillator which has a given volume depends on the density of the test fluid. Mechanical densimetry was used for the continuous recording of blood density in anesthetized animals and for the measurement of blood and plasma samples from human beings during different experimental conditions. Author (ESA)

N85-14457# Copenhagen Univ. (Denmark). Lab. of Human Physiology.
THE INFLUENCE OF ANGIOTENSIN ON THE MAINTENANCE OF VENOUS TONE. THE EFFECT OF LOWER BODY NEGATIVE PRESSURE (LBNP) AND ANGIOTENSIN BLOCKADE c52
F. Bonde-Petersen, P. Malsaker, B. Elmann-Larsen, and O. Henriksen (Hvidovre Hospital, Copenhagen) *In* ESA Life Sci. Res. in Space Aug. 1984 p 183-184 refs Sponsored by Danish Space Board (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The effect of lower body negative pressure (LBNP) was studied in 6 normal male subjects during systemic Angiotensin II blockage with Captopril. The protocol included measurements of heart rate, blood pressure (BP) peripheral venous pressure (PVP) and peripheral venous compliance (PVC) using air-plethysmography (left arm) and strain-gage plethysmography (right leg). Administration of 100 mg Captopril decreases PVC in arm and leg, and during LBNP venous pooling also decreases. The same protocol was used to study BP hemostasis. The results from the two studies imply that during LBNP, systemic blockade of Angiotensin II enhances the sympatheticoadrenal activation and the release of vasopressin creating a decrease in PVC. If the compliance in the hepato-splanchnic area is increased simultaneously, this might explain decreased orthostatic tolerance during LBNP.
Author (ESA)

N85-14458# Copenhagen Univ. (Denmark). Lab. for Human Physiology.
HEMODYNAMICS AND PLASMA ARGININE VASOPRESSIN DURING WATER IMMERSION IN NORMAL MAN c52
P. Norsk, F. Bonde-Petersen, and J. Warberg *In* ESA Life Sci. Res. in Space Aug. 1984 p 187-190 refs (For primary document see N85-14425 05-51)
(Grant DSB-1112-33/83; DSB-1112-32/83)
Avail: NTIS HC A14/MF A01

To examine the influence of increase in central venous pressure (CVP) on plasma concentration of arginine vasopressin (plasma AVP), 7 healthy males were studied during control in the erect sitting position wearing a water regulated thermosuit, and during water immersion to the neck (WI) for 6 hr. The WI induces an increase in CVP, sustained during the whole 6 hr period, while plasma AVP is suppressed compared with control. Systolic arterial pressure increases due to immersion, while diastolic arterial pressure is unchanged. Heat rate decreases. There is no change in plasma osmolality when comparing control and WI. A pronounced osmotic diuresis, natriuresis and kaliuresis occurs, due to WI counteracting the acute increase in plasma volume. It is concluded that an isoosmotic increase in CVP suppresses plasma AVP.
Author (ESA)

N85-14459# Copenhagen Univ. (Denmark). Inst. of Medical Physiology C.
ENDOCRINE RESPONSES TO NONHYPOTENSIVE GRAVITATIONAL STRESS: VASOPRESSIN AND ALDOSTERONE c52
J. Warberg, P. Bie, A. Astrup, N. H. Secher (Glostrup County Hospital, Denmark), and K. SanderJensen (Glostrup County Hospital, Denmark) *In* ESA Life Sci. Res. in Space Aug. 1984 p 191-192 refs Sponsored by Danish Space Agency (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Young males were subjected to slow passive tilting to 20 deg or 40 deg which did not induce hypotension and the plasma concentrations of arginine vasopressin (pAVP) and aldosterone (pALDO) were determined together with intraarterial blood pressure (BP) and central venous pressure (CVP). Tilting to 20 deg has no effect on BP, pAVP and pALDO whereas 40 deg tilt causes a moderate increase in BP and pAVP together with a pronounced increase in pALDO. The CVP is lowered markedly and proportionately with the degree of tilting. Intravenous infusions of AVP have no effect on systemic vascular pressures but cause a pronounced decrease in subcutaneous blood flow. It is concluded that nonhypotensive gravitational stress is associated with increased ALDO secretion and lowered CVP but has little effect on AVP release. Modest increases in pAVP cause subcutaneous vasoconstriction without affecting systemic vascular pressures.
Author (ESA)

N85-14460# Copenhagen Univ. (Denmark). Dept. of Medical Physiology C.
ENDOCRINE RESPONSES TO HYPOTENSIVE GRAVITATIONAL STRESS: CATECHOLAMINES, PANCREATIC POLYPEPTIDE, AND VASOPRESSIN c52
P. Bie, J. Warberg, N. H. Secher (Glostrup County Hospital, Denmark), N. J. Christensen (Glostrup County Hospital, Denmark), K. SanderJensen (Glostrup County Hospital, Denmark), and J. Giese (Glostrup County Hospital, Denmark) *In* ESA Life Sci. Res. In Space Aug. 1984 p 193-195 refs Sponsored by Danish Space Agency (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The effect of slow passive head-up tilting to 60 deg was studied in 7 young, healthy volunteers with catheters in a brachial artery and in the superior vena cava. Pressures were measured continuously and arterial plasma samples were analyzed with respect to sympathetic (adrenaline, noradrenaline) and parasympathetic (pancreatic polypeptide) activity as well as to water balance hormones: vasopressin, angiotensin II and aldosterone. Central venous pressure decreases upon tilting and remains almost constant until tilting is terminated. During the first part of the tilting period, blood pressure is maintained, pulse pressure decreases, and heart rate increases. After 19 min tilting had to be terminated due to dizziness, nausea, paleness and decreases in blood pressure, pulse pressure and heart rate. Author (ESA)

N85-14461# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.

GLUCOSE TOLERANCE IN TRAINED AND UNTRAINED SUBJECTS DURING HEAD-DOWN TILT (6 DEG) c52

H. M. Wegmann, F. Baisch, and G. Schaefer *In* ESA Life Sci. Res. in Space Aug. 1984 p 197-201 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Prior to, during, and after a 7-day bedrest study (6 deg head-down tilt) 4 highly trained athletes (A) and 4 nontrained subjects (NA) were subjected to a standard 2 hr oral glucose tolerance test. Responses of blood glucose, of plasma insulin and C-peptide were evaluated at 30 min intervals after ingestion. Insulin responses to glucose load are markedly elevated during and 2 days after bedrest compared with pre-bedrest responses. However, elevations in NA are significantly more pronounced. Changes in glucose responses due to bedrest are minor. The response patterns of C-peptide suggest that the observed elevations of insulin during bedrest are caused by higher secretion rates rather than by a diminished clearance from the circulatory system. Author (ESA)

N85-14462# European Inst. of Environmental Cybernetics, Athens (Greece). Hypokinetic Physiology Lab.

GENERAL RESISTANCE OF ORGANISM OF RATS UNDER HYPOKINESIA

Yan G. Zorbas and Vassili R. Bobylev *In* ESA Life Sci. Res. in Space Aug. 1984 p 203-206 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Resistance of 250 male mongrel rats under 90-days of hypokinesia was studied. General resistance was evaluated by body weight loss, hypothalamo-hypopheseo-adrenal system (HHAS) state, and sensitivity to ionizing radiation. The hypokinetic syndrome is manifested in a three-phase structure reaction characterized by a change in the general condition of organism, body weight loss, and activity of the HHAS. It is concluded that hypokinesia induces substantial changes in the general resistance of organism of rats and their sensitivity to ionizing radiation conditions. Author (ESA)

N85-14463# Brussels Univ. (Belgium). Service d'Orthopedie-Traumatologie.

BONE STRUCTURE AND MICROGRAVITY [STRUCTURE OSSEUSE ET MICROGRAVITE] c52

M. Hinsenkamp *In* ESA Life Sci. Res. in Space Aug. 1984 p 209-214 refs In FRENCH (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Space flight effects of bone tissue are reviewed. Lack of mechanical stress is probably the main cause of demineralization in weightlessness. Hormonal and vascular factors are not thought to play a major role in bone changes, but may lower tissue response thresholds to mechanical stress variations. In flight measurement of bone stress, especially in the lower limbs, is suggested. Author (ESA)

N85-14464# Cologne Univ. (West Germany). Inst. fuer Anatomisches.

LOSS OF BONE SUBSTANCE IN CONSEQUENCE OF AMPUTATION AS A MODEL FOR THE ADAPTATION TO MICROGRAVITY c52

B. Kummer *In* ESA Life Sci. Res. in Space Aug. 1984 p 215-217 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Bone readaptation after demineralization caused by prolonged weightlessness was simulated using a computer program based on Pauwels theory. The proximal ends of two femora from amputed legs were used to represent stages of adaptation to reduced mechanical stresses. The analysis of the shape of their cross-sections and the distribution of the dense material shows very good parallels with pictures obtained with the computer model. Results suggest that the mathematical function describes, at least qualitatively, the process of functional adaptation of the bone with a sufficient approximation. Author (ESA)

N85-14465# Limburg State Univ., Maastricht (Netherlands). Dept. of Biochemistry.

VITAMIN K AND THE METABOLIC STATE OF BONE c52

Cees Vermeer *In* ESA Life Sci. Res. in Space Aug. 1984 p 219-224 refs Sponsored by Netherlands Division for Health Research TNO (For primary document see N85-14425 05-51)

(Grant MD-82145)

Avail: NTIS HC A14/MF A01

In vivo synthesis of GIA-containing proteins, particularly the bone protein osteocalcin, is discussed. The function of osteocalcin is not completely understood, but evidence indicates that it mediates the regulation of the deposition of calcium phosphate in bone. Since carboxylases from different types of tissue display different substrate specificities, substrate analogs might be found that preferentially inhibit one type of carboxylase. Whether the inhibition or stimulation of the carboxylase in bone tissue might be a remedy against the loss of bone mass during osteoporosis or under microgravity conditions is not known. Author (ESA)

N85-14466# Mainz Univ. (West Germany). Dept. of Physiology.

THE EUROPEAN VESTIBULAR EXPERIMENTS IN THE SPACELAB 1 MISSION c52

Rudolf vonBaumgarten *In* ESA Life Sci. Res. in Space Aug. 1984 p 227-228 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Measurements of the otolith system threshold, of adaptation of the vestibular system to the space environment, and of the effects of optokinetic and of semicircular canal function undisturbed by concomittant otolithic stimulation were carried out on Spacelab. A vestibular helmet contained electronic amplifiers for recording the electro-oculogram, respiration and blood volume pulse, and the heating and cooling devices and pumps for gas calorization of both ears. A visor in front of the left eye contained a television monitor for optokinetic stimulation with prerecorded vertically or horizontally moving stripe patterns, and, in front of the right eye, a charged coupled device television camera to record movements and position of the right eye with infrared illumination in complete darkness. Caloric nystagmus is reported. Author (ESA)

N85-14467# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

THRESHOLDS OF PERCEPTION OF WHOLE BODY LINEAR OSCILLATION: MODIFICATION BY SPACEFLIGHT c52

A. J. Benson *In* ESA Life Sci. Res. in Space Aug. 1984 p 229-235 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Thresholds for the detection of linear oscillatory motion at 0.3 Hz in the X, Y and Z body axes were made during the flight of Spacelab-1 and on the ground pre and post-flight, using the method of limits with a single staircase procedure. Measures obtained on 3 crew members in-flight exhibit thresholds greater, by a factor of 1.5 to 4.3, than those obtained pre-flight. Post-flight, two crew members have significantly elevated X and Y axis thresholds whereas the other two crew members have lowered thresholds in X, Y and Z axes. Thresholds returned to pre-flight levels by the second post-flight day. Author (ESA)

N85-14468*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE ADAPTATION OF VESTIBULO-SPINAL REFLEXES AS A FUNCTION OF SPACEFLIGHT AND THEIR RELATIONSHIP TO SPACE MOTION SICKNESS c52

Millard F. Reschke, D. J. Anderson (Michigan Univ., Ann Arbor), J. L. Homick, J. T. Baker, S. J. Wood, and W. G. Crosier *In* ESA Life Sci. Res. in Space Aug. 1984 p 237-245 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

The hypothesis that exposure to prolonged free fall is a form of sensorymotor rearrangement rather than a direct change in

otolith sensitivity or sensory compensation for a reduced otolith input is discussed. Data from Spacelab-1 experiment 1NS-104 are presented to support an otolith reinterpretation hypothesis. This experiment measured vestibulo-spinal reflex changes as a function of sustained free fall. Findings indicate that when a monosynaptic reflex (H-reflex), measured from the major postural muscles (soleus) is used, adaptation to space flight includes a change in how the central nervous system interprets a fall. In a normal gravity environment a sudden unexpected fall produces a potentiated H-reflex. After 7 days inflight, an equivalent fall does not potentiate the reflex. Postflight a greatly increased reflex is observed in those crewmen most susceptible to space motion sickness.
Author (ESA)

N85-14469# Technische Univ., Munich (West Germany). Dept. of Otolaryngology.
CALORIC STIMULATION OF THE VESTIBULAR SYSTEM IN MICROGRAVITY c52
H. Scherer, A. H. Clarke, and U. Brand (Swedish Airforce) *In* ESA Life Sci. Res. in Space Aug. 1984 p 247-249 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The caloric experiment carried out during the Spacelab 1 mission tested Barany's theory of convection in microgravity. Contrary to expectation, a caloric nystagmus is elicited in both test subjects. The intensity of the response is comparable to that found on Earth, although during the first few days in space the vestibulo-ocular reflex is partly suppressed by the adaptation to the microgravity conditions. It is indicated that investigation of the interplay between semicircular canal and otolith receptors is necessary to clarify fully the mechanisms in the peripheral vestibular system.
Author (ESA)

N85-14470# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
INNER EAR CHARACTERISTICS DURING 7 DAY ANTIORTHOSTATIC BEDREST (6 DEG HEAD DOWN TILT) c52
G. Aust, H. Denz, and F. Baisch *In* ESA Life Sci. Res. in Space Aug. 1984 p 251-255 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The responses to bithermal monaural caloric stimulation with water at 30 and 44 C, and the pure tone hearing threshold were measured in male volunteers before, during and after 0 g simulation by 6 deg head down tilt (HDT). Nystagmus frequency and slow phase velocity are lower than at control level after 20 hr in HDT position. From thereon they increase and reach an average value above control at the end of the HDT period; 30 hr later they are still elevated, but are normal again 4 days after termination of HDT. Hearing thresholds improve 20 hr after beginning of HDT. However, they are above control on day 3 during and at the end of the HDT period. Similar values are measured 30 hr later.
Author (ESA)

N85-14471# Forschungsinstitut fuer Anthropotechnik, Wachtberg (West Germany).
VISUAL-VESTIBULAR INTERACTION IN HUMAN MOTION PERCEPTION c52
G. Doerfel and H. Distelmaier *In* ESA Life Sci. Res. in Space Aug. 1984 p 257-260 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Human ability to perceive differences between optically and mechanically presented motion information was investigated. Difference perception improves with increased differences and larger acceleration values, but subjects have difficulties especially in perceiving small differences with smaller acceleration values. Even when visual and mechanical acceleration values were identical subjects sometimes get the impression of existing differences, which might be interpreted as perceptual noise according to signal detection theory. Using signal detection theory for classifying subjects with respect to motion information discrimination ability reveals large interindividual differences. Mean acceleration value at the perceptual threshold is 0.5 m/sec/sec within the perceptual range investigated.
Author (ESA)

N85-14472# Stirling Univ. (Scotland). Dept. of Psychology.
MEDICATION INTERFERENCE WITH SPACE RESEARCH: AN EXAMPLE FROM A MASS-DISCRIMINATION EXPERIMENT ON SPACELAB 1 c52
Helen E. Ross and Edwin Schwartz (DFVLR, Cologne) *In* ESA Life Sci. Res. in Space Aug. 1984 p 261-264 refs Sponsored by ESA, UK Royal Society and UK Medical Research Council (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

The effects of anti motion sickness drugs on mass discrimination were tested to determine whether the use of these drugs in space could contaminate an experiment on the effect of weightlessness on mass discrimination. A significant deterioration in performance is found for oral scopolamine/dextroamphetamine and transdermal scopolamine. The deterioration is much less than that found under microgravity, so medication cannot account for the results of parabolic flights or of Spacelab. However, medication taken predominantly in the early days of a mission could interfere with the measurement of adaptation to weightlessness.
Author (ESA)

N85-14473# Groningen Rijksuniversiteit (Netherlands). Dept. of Neurophysiology.
ESTIMATING NUMBER, TIME AND LENGTH; A BASELINE STUDY c53
F. Veringa *In* ESA Life Sci. Res. in Space Aug. 1984 p 265-269 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Human performance in estimating numerosity, length and time interval, and in reproducing force was studied. Subjects can achieve lasting stability and can be reliably calibrated. External interference with sensory input systems can greatly change performance, and body awareness, as can perturbation of sensory systems controlling motor output. This is demonstrated in length indicating tasks. Blindfolding, local anesthesia, loads and accelerations, reduced gravity, and experimental pain can disturb input and motor control. To delimit proprioceptive contributions in voluntary aiming movements, microgravity experiments are needed. Definition of visual, proprioceptive and experoceptive control over voluntary activities in space aids selection and training of spacecrews, and in space ergonomy. A stand alone computerized control for length indication experiments is specified.
Author (ESA)

N85-14474# Clinical Research Centre, London (England).
SLEEP PHYSIOLOGY IN WEIGHTLESSNESS (EXPERIMENT 1ES 030) c52
O. Quadens (Univ. Instelling Antwerpen, Belgium), H. L. Green, and S. F. D. Stott *In* ESA Life Sci. Res. in Space Aug. 1984 p 271-274 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

Four channel recorders were used to record the electrocardiogram (EKG) the muscle activity (EMG) and eye movements (EOG) during the Spacelab 1 mission. The EKG was recorded during the entire mission, the EOG and the EMG during the first two sleep periods only. The EKG shows minor changes as a function of weightlessness whereas the EOG shows an important increase in the number of eye movements during night zero as compared to the pre and postflight baseline data. The electroencephalogram was recorded with the same recorder during parabolic flights. It shows a significant increase in the theta frequency band during the acrophase of the parabolas.
Author (ESA)

N85-14475# Glostrup Hospital (Denmark). Sleep Laboratory Dept.
COMPUTERIZED SLEEP STAGING BY DETECTING EYE AND HAND MOVEMENT, DELTA EEG ACTIVITY AND EMG, USING PORTABLE SOLID STATE TECHNIQUE c53
Gordon Wildschiodtz *In* ESA Life Sci. Res. in Space Aug. 1984 p 275-278 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

A computerized sleep recording system was developed from eye and hand movement detectors, EEG-delta detectors and EMG detectors. It can be used for sleep recording in space to detect circadian rhythm disturbances and to evaluate sleep deprivation. The influence of weightlessness on delta activity and number of movements are studied. Author (ESA)

N85-14476# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

OVERVIEW OF GERMAN MICROGRAVITY ACTIVITIES IN THE FIELD OF LIFE SCIENCE

W. G. Frings, H. S. Anton, and F. Dahl *In* ESA Life Sci. Res. in Space Aug. 1984 p 281-284 (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

The planning of the German Spacelab Mission D2 and European participation in the Columbus space station are outlined. Biology and medicine projects are listed. Author (ESA)

N85-14477# Nijmegen Univ. (Netherlands). Dept. of Biochemistry.

SPACE STATION: NEW FRONTIER FOR LIFE SCIENCES IN SPACE **c12**

Sjoerd L. Bonting *In* ESA Life Sci. Res. in Space Aug. 1984 p 287-292 refs (For primary document see N85-14425 05-51)

Avail: NTIS HC A14/MF A01

Use of a permanently manned space station for life sciences, including bioprecessing for scientific and commercial purposes is outlined. Advantages over Spacelab/Shuttle missions are: longer experiment duration, more flexible timeline, repeatability of experiments, and easy changes in experimental conditions. In the context of a European contribution to and participation in a U.S. Space Station, a joint life science dedicated module with a basic complement of the facilities needed to carry out a well coordinated, comprehensive life science program is proposed. A second module could supply additional, more advanced experimental facilities for limited periods of time. The program and the required facilities are described. Author (ESA)

N85-14478# Connecticut Univ., Farmington. School of Medicine.

TOXICOLOGY AND METABOLISM OF NICKEL COMPOUNDS Progress Report, 1 Dec. 1983 - 30 Nov. 1984

F. William Sunderman, Jr. 15 Jul. 1984 18 p refs

(Contract DE-AC02-76EV-03140)

(DE84-014919; DOE/EV-03140/8) Avail: NTIS HC A02/MF A01

The toxicology of nickel compounds (e.g., NiCl2, Ni3S2, Ni(CO)4) was investigated in rats. The following new knowledge was acquired: renal cytosol from (63) NiCl2 treated rats contains at least ten (63) Ni binding proteins and polypeptides with molecular weights ranging from 168,000 to less than 4,000 daltons; parenteral administration of NiCl2 to rats transiently diminishes hepatic concentrations of reduced and oxidized glutathione and enhances lipid peroxidation; tetraethylenepentamine is equally effective as diethyldithiocarbamate as an antidote for acute Ni(CO)4 poisoning in rats; Ni[2]-induction of heme oxygenase activity in rat kidney is sustained for only 3 days of repeated treatments and thereafter gradually decreases, indicating adaptive tolerance for Ni[2] toxicity; carcinogenesis bioassays of 17 nickel compounds by IR administration to rats demonstrate close correlation between the induction of erythrocytosis at 1 to 4 months post-injection and the subsequent incidence of renal cancers; immunoreactive erythropoietin concentration is increased in kidney extracts of rats following IR injection of Ni3S2, supporting the role of erythropoietin in Ni3S2-induced erythrocytosis. DOE

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-14479 Ohio State Univ., Columbus.

THE EFFECT OF PROPRANOLOL ON THE TRAINING RESPONSE TO ENDURANCE EXERCISE IN NORMAL HUMAN ADULTS Ph.D. Thesis

Patrick Alan Cleary 1984 93 p

Avail: Univ. Microfilms Order No. DA8418928

Endurance exercise results in adaptive changes in the cardiopulmonary system in both normal subjects and in patients with coronary artery disease. Sustained beta adrenergic stimulation has been postulated as one of the key mechanisms responsible for cardiopulmonary conditioning. To better test this hypothesis, fourteen healthy men and women, ages 22-45 years, underwent ten weeks of vigorous aerobic conditioning. Eight received 160 mg propranolol therapy (40mg q 6 hrs) and six received no drug therapy during the conditioning period. Four graded maximal exercise tests on bicycle ergometers were administered before starting drugs or training (Test 1); following three days of oral propranolol/no drug therapy (Test 2); after ten weeks of propranolol therapy and training (Test 3); following removal of beta blockade after the ten weeks training period (Test 4). The overall improvement for both groups was statistically similar between Test 1 and Test 4. Thus, it appears that while beta adrenergic blockade does not attenuate exercise conditioning, it nevertheless has a significant effect on the degree to which certain training responses are manifested in normal subjects. Dissert. Abstr.

N85-14480# Brookhaven National Lab., Upton, N. Y. Medical Research Center.

IN VIVO NEUTRON ACTIVATION ANALYSIS: BODY COMPOSITION STUDIES IN HEALTH AND DISEASE

Kenneth J. Ellis and Stanton H. Cohn 1984 14 p refs Presented at the 5th Intern. Conf. on Nucl. Methods in Environ. and Energy Res., Mayaquez, Puerto Rico, 2 Apr. 1984

(Contract DE-AC02-76CH-00016)

(DE84-014092; BNL-34753; CONF-840408-15) Avail: NTIS HC A02/MF A01

In vivo analysis of body elements by neutron activation which is an important tool in medical research is discussed. It provides a direct in vivo quantitative measure of body composition of human beings. Basic physiological differences related to age, sex, race, and body size were assessed by this technique. The diagnosis and management of patients with various metabolic disorders and diseases was demonstrated. In vivo neutron activation analysis (IVNAA) of calcium, phosphorus, sodium, chlorine, nitrogen, hydrogen, and potassium was utilized. These elements serve as the basis for a four compartment model of body composition: protein, water, mineral ash, and fat. Variations in these compartments are demonstrated in clinical research programs investigating obesity, anorexia, cancer, renal failure, osteoporosis, and normal aging. The IVNAA provides an approach to the evaluation of clinical diagnosis, efficacy of therapeutic regimens, and monitoring of the aging process. DOE

N85-14481# California Univ., Livermore. Lawrence Livermore Lab.

CLINICAL MEASUREMENTS USING FIBER OPTICS AND OPTRODES

Fred P. Milanovich, Tomas B. Hirschfeld, Francis T. Wang, Stanley M. Klainer (ST and E Technical Services, Inc., San Ramon, Calif.), and David Walt (Tufts Univ., Medford, Mass.) Jul. 1984 9 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 21 Aug. 1984

(Contract W-7405-eng-48)

(DE84-015043; UCRL-90769; CONF-840872-7) Avail: NTIS HC A02/MF A01

Fiber optics, optrodes, and fluorescence spectroscopy were combined to form the new technology of remote fiber fluorimetry (RFF). Both in-vivo and in-vitro clinical measurements can be made by using this technique. The optrode, and fiber termination with preselected chemical or physical properties, is attached to the distal end of the optical fiber so that specific, in-situ measurements can be made. Some RFF systems for pH, blood pressure, oxygen,

and carbon dioxide are being completed, and other optrodes are in the development stages. DOE

N85-14482# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Forschungsbereich Flugmechanik/Flugfuehrung.
THE APPLICATION OF BASIC CONTROL LAWS TO HUMAN MEDICINE
Fred Thomas Jul. 1984 94 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-84-13) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 19

Proposals for complementary medical and aptitude checks for aerospace personnel expected to remain in service over extended periods of time (decades) were worked out. Laws such as those governing a regulation system (feedback phenomenon) were sought in medical and biological disciplines. The human organism is compared to a multi-entry regulation system of high rank where accumulated toxins are perturbations leading to organ damage. Diseases resulting from perturbed regulation are mostly of chronic type. Diagnosis methods were developed from the response of the system to an electrical perturbation signal. Author (ESA)

N85-14483# Karolinska Inst., Stockholm (Sweden). Lab. for Clinical Stress Research.
CATECHOLAMINE EXCRETION AND SUBJECTIVE RATINGS OF TENSION DURING AUTOGENIC TRAINING AND MENTAL STRESS
Lars Torsvall, Gunilla Nilsson, Rolf Nilsson, Anders Schioeler, Gun-Britt Sundby, and Torbjoern Aakerstedt Dec. 1983 10 p refs
(Rept-172; ISSN-0280-2783) Avail: NTIS HC A02/MF A01

Ten female students served as their own controls in an investigation of acute effects of autogenic training, and stress reactions with preceding relaxation. Dependent variables were urinary catecholamine excretion and subjective ratings of tension, while the mental stressor consisted of a color word conflict test. Results show a significant increase of adrenaline and noradrenaline excretion and subjective tension during the stress situation. Pairwise t-tests reveal that the stress response of the catecholamines is greater after relaxation. The intraindividual correlations between the physiological and the psychological variables are significant. Results suggest that relaxation may increase the readiness for demanding situations. Author (ESA)

N85-14484# John B. Pierce Foundation of Connecticut, New Haven.
THERMOREGULATORY CONSEQUENCES OF LONG-TERM MICROWAVE EXPOSURE AT CONTROLLED AMBIENT TEMPERATURES Final Report
E. R. Adair, D. E. Spiers, R. O. Rawson, B. W. Adams, D. K. Sheldon, P. J. Pivirotto, and G. M. Akel Aug. 1984 91 p refs (Grant EPA-R-807085)
(PB84-236603; EPA/600/1-84/009) Avail: NTIS HC A05/MF A01 CSCL 06R

The study was designed to identify and measure changes in thermoregulatory response systems, both behavioral and physiological, that may occur when squirrel monkeys are exposed to 2450-MHz CW microwaves 40 hours/week for 15 weeks. Microwave power densities explored were 1 and 5 mW/sq. cm. (SAR = 0.16 W/kg per mW/sq. cm.) and were presented at controlled environmental temperatures of 25, 30, and 35 C. Standardized tests, conducted periodically, assessed changes in thermoregulatory responses. Results showed no alteration of metabolic rate, internal body temperature, or thermoregulatory behavior by microwave exposure although the ambient temperature prevailing during chronic exposure could exert an effect. The most robust consequence of microwave exposure was a reduction in body mass which appeared to be a function of microwave power density. Author (GRA)

N85-14445# Tours Univ. (France). Lab. de Biophysique.
ULTRASONIC STUDY OF EARLY CARDIOVASCULAR ADAPTATION TO ZERO GRAVITY
L. Pourcelot, Ph. Arbeille, J. M. Pottier, F. Patat, P. Mignier, A. Guell (Service de Neurologie, Toulouse), and C. Gharib (Universite C. Bernard, Lyon) *In* ESA Life Sci. Res. in Space Aug. 1984 p 119-123 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14446# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
LEFT HEART VENTRICULAR FUNCTION DURING A 7 DAY ZERO-G SIMULATION (6 DEG HEAD DOWN TILT)
F. Baisch and L. Beck *In* ESA Life Sci. Res. in Space Aug. 1984 p 125-132 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14447# Rome Univ. (Italy). Postgraduate School of Aerospace Medicine.
THREE-DIMENSIONAL BALLISTOCARDIOGRAPHY IN WEIGHTLESSNESS (EXPERIMENT 1ES 028)
A. Scano, Eduardo Rispoli, Felice Strollo, Giorgo Brazzoduro, Franco Prandi, and Giovanni Cama *In* ESA Life Sci. Res. in Space Aug. 1984 p 133-139 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14448# Clinical Research Centre, London (England).
MINIATURE PERSONAL PHYSIOLOGICAL TAPE RECORDER (EXPERIMENT 1ES 30)
H. L. Green, F. D. Stott, and O. Petre-Quadens (Univ. Instelling Antwerpen, Belgium) *In* ESA Life Sci. Res. in Space Aug. 1984 p 141-144 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14449# Copenhagen Univ. (Denmark). [a]Lab. of Human Physiology.
CARDIAC OUTPUT MEASURED BY MASS SPECTROSCOPY
F. Bonde-Petersen *In* ESA Life Sci. Res. in Space Aug. 1984 p 145-148 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14450# Karolinska Inst., Stockholm (Sweden). Dept. of Medical Engineering.
CARDIAC OUTPUT MEASUREMENT WITH SOLUBLE GASES
Dag Linnarsson and Hans Larsson *In* ESA Life Sci. Res. in Space Aug. 1984 p 149-150 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14451# Deutsche Sporthochschule, Cologne (West Germany).
PHYSICAL PERFORMANCE CAPACITY AFTER A 7 DAY HEAD-DOWN TILT (-6 DEG)
J. Stegemann, D. Essfeld, and U. Hoffmann *In* ESA Life Sci. Res. in Space Aug. 1984 p 151-157 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14452# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
LEG VOLUME CHANGES. RESPONSES TO LOWER BODY NEGATIVE PRESSURE (LBNP) DURING 7 DAYS OF ZERO-G SIMULATION (6 DEG HEAD-DOWN TILT (HDT))
E. W. Mueller, H. Hohlweck, G. Plath, and F. Baisch *In* ESA Life Sci. Res. in Space Aug. 1984 p 159-162 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14453# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
HEART RATE VARIABILITY DURING 7 DAY HEAD-DOWN TILT

(6 DEG)
A. Samei and F. Baisch *In* ESA Life Sci. Res. in Space Aug. 1984 p 163-167 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14454# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
COMPARISON OF SIMULATION OF WEIGHTLESSNESS BY HEAD DOWN TILT (HDT) AND WATER IMMERSION (WI)
H. Loellgen (Medical Clinic St. Vincenz-Hospital, Limburg, West Germany), K. E. Klein, J. Beier, J. R. Hordinsky, F. Baisch, G. vonNieding (Federal Bureau of Health, Berlin), and H. Just (Freiburg Univ., West Germany) *In* ESA Life Sci. Res. in Space Aug. 1984 p 169-174 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14455# Hamburg Univ. (West Germany). Dept. of Ophthalmology.
INTRAOCULAR FLUID DYNAMICS IN MICROGRAVITY
J. Draeger, K. Hanke, R. Berger, and E. Rumberger *In* ESA Life Sci. Res. in Space Aug. 1984 p 175-177 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14456# Graz Univ. (Austria). Inst. fuer Physiologisches.
MEASUREMENT OF BLOOD AND PLASMA DENSITY WITH THE MECHANICAL OSCILLATOR TECHNIQUE
T. Kenner and H. Hinghofer-Szalkay *In* ESA Life Sci. Res. in Space Aug. 1984 p 179-182 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14457# Copenhagen Univ. (Denmark). Lab. of Human Physiology.
THE INFLUENCE OF ANGIOTENSIN ON THE MAINTENANCE OF VENOUS TONE. THE EFFECT OF LOWER BODY NEGATIVE PRESSURE (LBNP) AND ANGIOTENSIN BLOCKADE
F. Bonde-Petersen, P. Malsaker, B. Elmann-Larsen, and O. Henriksen (Hvidovre Hospital, Copenhagen) *In* ESA Life Sci. Res. in Space Aug. 1984 p 183-184 refs Sponsored by Danish Space Board (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14458# Copenhagen Univ. (Denmark). Lab. for Human Physiology.
HEMODYNAMICS AND PLASMA ARGININE VASOPRESSIN DURING WATER IMMERSION IN NORMAL MAN
P. Norsk, F. Bonde-Petersen, and J. Warberg *In* ESA Life Sci. Res. in Space Aug. 1984 p 187-190 refs (For primary document see N85-14425 05-51)
(Grant DSB-1112-33/83; DSB-1112-32/83)
Avail: NTIS HC A14/MF A01

N85-14459# Copenhagen Univ. (Denmark). Inst. of Medical Physiology C.
ENDOCRINE RESPONSES TO NONHYPOTENSIVE GRAVITATIONAL STRESS: VASOPRESSIN AND ALDOSTERONE
J. Warberg, P. Bie, A. Astrup, N. H. Secher (Glostrup County Hospital, Denmark), and K. SanderJensen (Glostrup County Hospital, Denmark) *In* ESA Life Sci. Res. in Space Aug. 1984 p 191-192 refs Sponsored by Danish Space Agency (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14460# Copenhagen Univ. (Denmark). Dept. of Medical Physiology C.
ENDOCRINE RESPONSES TO HYPOTENSIVE GRAVITATIONAL STRESS: CATECHOLAMINES, PANCREATIC POLYPEPTIDE, AND VASOPRESSIN
P. Bie, J. Warberg, N. H. Secher (Glostrup County Hospital, Denmark), N. J. Christensen (Glostrup County Hospital, Denmark), K. SanderJensen (Glostrup County Hospital, Denmark), and J. Giese (Glostrup County Hospital, Denmark) *In* ESA Life Sci. Res. In Space Aug. 1984 p 193-195 refs Sponsored by Danish Space Agency (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14461# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
GLUCOSE TOLERANCE IN TRAINED AND UNTRAINED SUBJECTS DURING HEAD-DOWN TILT (6 DEG)
H. M. Wegmann, F. Baisch, and G. Schaefer *In* ESA Life Sci. Res. in Space Aug. 1984 p 197-201 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14463# Brussels Univ. (Belgium). Service d'Orthopedie-Traumatologie.
BONE STRUCTURE AND MICROGRAVITY [STRUCTURE OSSEUSE ET MICROGRAVITE]
M. Hinsenkamp *In* ESA Life Sci. Res. in Space Aug. 1984 p 209-214 refs In FRENCH (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14464# Cologne Univ. (West Germany). Inst. fuer Anatomisches.
LOSS OF BONE SUBSTANCE IN CONSEQUENCE OF AMPUTATION AS A MODEL FOR THE ADAPTATION TO MICROGRAVITY
B. Kummer *In* ESA Life Sci. Res. in Space Aug. 1984 p 215-217 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14465# Limburg State Univ., Maastricht (Netherlands). Dept. of Biochemistry.
VITAMIN K AND THE METABOLIC STATE OF BONE
Cees Vermeer *In* ESA Life Sci. Res. in Space Aug. 1984 p 219-224 refs Sponsored by Netherlands Division for Health Research TNO (For primary document see N85-14425 05-51)
(Grant MD-82145)
Avail: NTIS HC A14/MF A01

N85-14466# Mainz Univ. (West Germany). Dept. of Physiology.
THE EUROPEAN VESTIBULAR EXPERIMENTS IN THE SPACELAB 1 MISSION
Rudolf vonBaumgarten *In* ESA Life Sci. Res. in Space Aug. 1984 p 227-228 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14467# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THRESHOLDS OF PERCEPTION OF WHOLE BODY LINEAR OSCILLATION: MODIFICATION BY SPACEFLIGHT
A. J. Benson *In* ESA Life Sci. Res. in Space Aug. 1984 p 229-235 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14468*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ADAPTATION OF VESTIBULO-SPINAL REFLEXES AS A FUNCTION OF SPACEFLIGHT AND THEIR RELATIONSHIP TO SPACE MOTION SICKNESS
Millard F. Reschke, D. J. Anderson (Michigan Univ., Ann Arbor), J. L. Homick, J. T. Baker, S. J. Wood, and W. G. Crosier *In* ESA Life Sci. Res. in Space Aug. 1984 p 237-245 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14469# Technische Univ., Munich (West Germany). Dept. of Otolaryngology.
CALORIC STIMULATION OF THE VESTIBULAR SYSTEM IN MICROGRAVITY

H. Scherer, A. H. Clarke, and U. Brand (Swedish Airforce) *In* ESA Life Sci. Res. in Space Aug. 1984 p 247-249 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14470# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.
INNER EAR CHARACTERISTICS DURING 7 DAY ANTIORTHOSTATIC BEDREST (6 DEG HEAD DOWN TILT)
G. Aust, H. Denz, and F. Baisch *In* ESA Life Sci. Res. in Space Aug. 1984 p 251-255 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14471# Forschungsinstitut fuer Anthropotechnik, Wachtberg (West Germany).
VISUAL-VESTIBULAR INTERACTION IN HUMAN MOTION PERCEPTION
G. Doerfel and H. Distelmaier *In* ESA Life Sci. Res. in Space Aug. 1984 p 257-260 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14472# Stirling Univ. (Scotland). Dept. of Psychology.
MEDICATION INTERFERENCE WITH SPACE RESEARCH: AN EXAMPLE FROM A MASS-DISCRIMINATION EXPERIMENT ON SPACELAB 1
Helen E. Ross and Edwin Schwartz (DFVLR, Cologne) *In* ESA Life Sci. Res. in Space Aug. 1984 p 261-264 refs Sponsored by ESA, UK Royal Society and UK Medical Research Council (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14474# Clinical Research Centre, London (England).
SLEEP PHYSIOLOGY IN WEIGHTLESSNESS (EXPERIMENT 1ES 030)
O. Quadens (Univ. Instelling Antwerpen, Belgium), H. L. Green, and S. F. D. Stott *In* ESA Life Sci. Res. in Space Aug. 1984 p 271-274 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-14485# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abteilung Flugphysiologie und -Psychologie.
THE CONSTRUCTION OF AUDITIVE TESTS OF ATTENTION AND SPATIAL ORIENTATION AND THEIR FACTORIAL STRUCTURE
Joachim Winke Jun. 1984 78 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-21) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 26

Tests of spatial orientation and attention were constructed for the selection of air traffic controllers. Items are presented acoustically via loudspeakers or headphones. These methods were compared with traditional paper-pencil tests where items are presented visually. The relationship between the sensory modalities used to present the test problem and the mental abilities for information processing were studied. There are no clear modality specific factors revealed by factor analyses: most of the variance is determined by well known modality-unspecific cognitive factors. Author (ESA)

N85-14486# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.
INVESTIGATION OF PILOT BEHAVIOR IN FLIGHT TESTS WITH A RATE COMMAND/ATTITUDE HOLD CONTROL SYSTEM
Dietrich Altenkirch Feb. 1984 59 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-25) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23

Handling qualities of a rate command/attitude hold system for pitch and roll axes, using a sidegrip as pilot's control, were evaluated during flight tests. The influence of heading hold and wing levelling functions were investigated. An MFB 320 flight simulator was used as a flight test vehicle. Overall system behavior was evaluated by two pilots in 84 instrument landing approaches. Pilot-vehicle performance was determined by measured aircraft state and performance parameters. The system clearly reduces the number of pilot command activations during the landing procedure. Author (ESA)

N85-14473# Groningen Rijksuniversiteit (Netherlands). Dept. of Neurophysiology.
ESTIMATING NUMBER, TIME AND LENGTH; A BASELINE STUDY
F. Veringa *In* ESA Life Sci. Res. in Space Aug. 1984 p 265-269 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

N85-14475# Glostrup Hospital (Denmark). Sleep Laboratory Dept.
COMPUTERIZED SLEEP STAGING BY DETECTING EYE AND HAND MOVEMENT, DELTA EEG ACTIVITY AND EMG, USING PORTABLE SOLID STATE TECHNIQUE
Gordon Wildschiodtz *In* ESA Life Sci. Res. in Space Aug. 1984 p 275-278 refs (For primary document see N85-14425 05-51)
Avail: NTIS HC A14/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-14487*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TWENTIETH ANNUAL CONFERENCE ON MANUAL CONTROL, VOLUME 1
Sandra G. Hart, comp. and Earl J. Hartzell, comp. Sep. 1984 653 p refs Conf. held at Moffett Field, Calif., 12-14 Jun. 1984 2 Vol.
(NASA-CP-2341-Vol-1; A-9879-Vol-1; NAS 1.55:2341-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 05H

The 48 papers presented were devoted to human operator modeling, application of models to simulation and operational environments, aircraft handling qualities, teleoperators, fault diagnosis, and biodynamics. For individual titles, see N85-14488 through N85-14534.

N85-14488*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
TIME SERIES MODELING OF HUMAN OPERATOR DYNAMICS IN MANUAL CONTROL TASKS
Daniel J. Biezad and David K. Schmidt *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 1-40 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A time-series technique is presented for identifying the dynamic characteristics of the human operator in manual control tasks from relatively short records of experimental data. Control of system excitation signals used in the identification is not required. The approach is a multi-channel identification technique for modeling multi-input/multi-output situations. The method presented includes statistical tests for validity, is designed for digital computation, and yields estimates for the frequency response of

the human operator. A comprehensive relative power analysis may also be performed for validated models. This method is applied to several sets of experimental data; the results are discussed and shown to compare favorably with previous research findings. New results are also presented for a multi-input task that was previously modeled to demonstrate the strengths of the method. Author

N85-14489*# Boeing Co., Seattle, Wash.
STATISTICAL TIME SERIES MODELS OF PILOT CONTROL WITH APPLICATIONS TO INSTRUMENT DISCRIMINATION
R. E. Altschul, P. M. Nagel, and F. Oliver *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 41-76 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A general description of the methodology used in obtaining the transfer function models and verification of model fidelity, frequency domain plots of the modeled transfer functions, numerical results obtained from an analysis of poles and zeroes obtained from z plane to s-plane conversions of the transfer functions, and the results of a study on the sequential introduction of other variables, both exogenous and endogenous into the loop are contained. B.G.

N85-14490*# Westfaelische Wilhelms Univ., Muenster (West Germany). Psychologisches Inst.
UTILIZATION OF HISTORIC INFORMATION IN AN OPTIMISATION TASK Abstract Only
Tom Boesser *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol 1 Sep. 1984 p 77 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

One of the basic components of a discrete model of motor behavior and decision making, which describes tracking and supervisory control in unitary terms, is assumed to be a filtering mechanism which is tied to the representational principles of human memory for time-series information. In a series of experiments subjects used the time-series information with certain significant limitations: there is a range-effect; asymmetric distributions seem to be recognized, but it does not seem to be possible to optimize performance based on skewed distributions. Thus there is a transformation of the displayed data between the perceptual system and representation in memory involving a loss of information. This rules out a number of representational principles for time-series information in memory and fits very well into the framework of a comprehensive discrete model for control of complex systems, modelling continuous control (tracking), discrete responses, supervisory behavior and learning. B.G.

N85-14491*# Systems Technology, Inc., Mountain View, Calif.
QUANTIFICATION OF CROSS-COUPLING AND MOTION FEEDTHROUGH FOR MULTIAXIS CONTROLLERS USED IN AN AIR COMBAT FLYING TASK
Wayne E. Jewell and Kevin D. Citurs (McDonnell Aircraft Co., St. Louis, Mo.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 79-90 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A real-time piloted simulation of an air-to-air combat flying task using a wings-level-turn aircraft and various novel controllers was conducted. One objective is to quantify how the pilot interacts with the controllers and control modes, including: (1) controller versus aircraft response; (2) proprioceptive cross-coupling among axes of the controllers; and (3) biodynamic cross-coupling between the aircraft motions and the controllers. In order to aid in identifying the items listed above, both the target aircraft and the large amplitude multimode aerospace research simulator (LAMARS) motion system were distributed with quasi-random sums-of-sinusoids. Since the disturbances were separated in frequency, spectral analysis techniques were used to identify the three items listed. The results of the spectral analysis of controller motions from the two-axis side stick, a twist grip mounted on the side stick, a thumb button mounted on the side stick, and conventional rudder pedals are presented. Conclusions and recommendations for further research are also presented. B.G.

N85-14492*# CAE Electronics Ltd., Montreal (Quebec).
SIX DEGREES OF FREEDOM CONTROL WITH EACH HAND? Abstract Only
Mike L. King *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 91 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

For some time man has made six degree of freedom inputs to a pair of dextrous manipulators using both hands simultaneously by the use of the master/slave concept. The advent of the microprocessor has the potential to make the master/slave concept redundant by replacing the master with a mathematical model. All spacecraft to date, including the space shuttle, that were flown in six degrees of freedom were controlled by using both hands, the left hand controlling translation and the right rotation. Almost inevitably the same principle was applied to the CANADARM. At the instigation of NASA the development of a device whereby both translation and rotation could be combined allowing full control with one hand was developed. The development and testing of the device, and the extension of its application into spaceflight control are described. Also the concept of an adaptable workstation for multi-maniipulator and spacecraft flight control is discussed. B.G.

N85-14493*# California Univ., Davis. Dept. of Mechanical Engineering.
A NONLINEAR FILTER FOR COMPENSATING FOR TIME DELAYS IN MANUAL CONTROL SYSTEMS
Ronald A. Hess and Andrew A. Myers *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 93-116 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A nonlinear filter configured to provide phase lead without accompanying gain distortion is analyzed and evaluated. The nonlinear filter is superior to a linear lead/lag compensator in its ability to maintain system stability as open loop crossover frequency is increased. Test subjects subjectively rated the filter as slightly better than a lead/lag compensator in its ability to compensate for delays in a compensatory tracking task. However, the filter does introduce unwanted harmonics. This is particularly noticeable for low frequency pilot inputs. A revised compensation method is proposed which allows such low frequency inputs to bypass the nonlinear filter. A brief analytical and experimental evaluation of the revised filter indicates that further evaluation in more realistic tasks is justified. Author

N85-14494*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
MODEL ESTIMATION AND IDENTIFICATION OF MANUAL CONTROLLER OBJECTIVES IN COMPLEX TRACKING TASKS
David K. Schmidt and Pin-Jar Yuan *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 117-148 refs (For primary document see N85-14487 05-54) (NAS4-1)
Avail: NTIS HC A99/MF A01 CSCL 05H

A methodology is presented for estimating the parameters in an optimal control structural model of the manual controller from experimental data on complex, multiinput/multioutput tracking tasks. Special attention is devoted to estimating the appropriate objective function for the task, as this is considered key in understanding the objectives and strategy of the manual controller. The technique is applied to data from single input/single output as well as multi input/multi outpuut experiments, and results discussed. Author

N85-14495*# University of Southern California, Los Angeles. Dept. of Electrical Engineering-Systems.
STRUCTURE ERRORS IN SYSTEM IDENTIFICATION
G. A. Bekey and F. Y. Hadaegh *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p

149-156 refs Sponsored in part by NSF (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

An approach to system identification is presented which explicitly takes structure errors into account and hence provides a systematic way for answering questions concerning the magnitude of estimated parameter errors resulting from structural errors. It is indicated that, from this point of view, it is possible to define near equivalence between process and model and to obtain meaningful theoretical results on solution error system identification. It remains to apply these results to large realistic problems such as those involving models of complex man machine systems. Author

N85-14496*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS OF CONTROL STICK PARAMETERS ON HUMAN CONTROLLER RESPONSE
D. W. Repperger and W. H. Levinson (Bolt, Beranek and Newman, Inc., Cambridge, Mass.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 157-172 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A fixed base laboratory tracking study was conducted to determine the effects of stick displacement and stick force characteristics on human tracking performance. Three different levels of control stick force/displacement characteristics and stick electrical gain were varied to observe their influence on RMS (Root Mean Square) tracking error and RMS control activity (stick output). The results indicated that both RMS tracking error and RMS control activity were influenced by the three different levels of control stick force/displacement characteristics and stick electrical gain. The human neuromotor time constant was affected by the electrical control gain of the stick while the spring stiffness of the stick influenced the time delay characteristics of the human response behavior. Author

N85-14497*# Systems Technology, Inc., Mountain View, Calif.
A METHOD FOR MEASURING THE EFFECTIVE THROUGHPUT TIME DELAY IN SIMULATED DISPLAYS INVOLVING MANUAL CONTROL
Wayne F. Jewell and Warren F. Clement *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 173-184 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The advent and widespread use of the computer-generated image (CGI) device to simulate visual cues has a mixed impact on the realism and fidelity of flight simulators. On the plus side, CGIs provide greater flexibility in scene content than terrain boards and closed circuit television based visual systems, and they have the potential for a greater field of view. However, on the minus side, CGIs introduce into the visual simulation relatively long time delays. In many CGIs, this delay is as much as 200 ms, which is comparable to the inherent delay time of the pilot. Because most GCIs use multiloop processing and smoothing algorithms and are linked to a multiloop host computer, it is seldom possible to identify a unique throughput time delay, and it is therefore difficult to quantify the performance of the closed loop pilot simulator system relative to the real world task. A method to address these issues using the critical task tester is described. Some empirical results from applying the method are presented, and a novel technique for improving the performance of GCIs is discussed. Author

N85-14498*# Systems Technology, Inc., Hawthorne, Calif.
EFFECTS OF TRANSPORT DELAYS OF MANUAL CONTROL SYSTEM PERFORMANCE
R. Wade Allen and Richard J. DiMarco *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 185-201 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Throughput or transport delays in manual control systems can cause degraded performance and lead to potentially unstable operation. With the expanding use of digital processors, throughput delays can occur in manual control systems in a variety of ways such as in digital flight control systems in real aircraft, and in equation of motion computers and computer generated images in simulators. Research has shown the degrading effect of throughput delays on subjective opinion and system performance and dynamic response. A generic manual control system model is used to provide a relatively simple analysis of and explanation for the effects of various types of delays. The consequence of throughput delays of some simple system architectures is also discussed. Author

N85-14499*# General Dynamics Corp., Fort Worth, Tex. Flight Control Systems Section.
STOL SIMULATION REQUIREMENTS FOR DEVELOPMENT OF INTEGRATED FLIGHT/PROPULSION CONTROL SYSTEMS
K. E. Sanders, D. C. Anderson, and J. H. Watson *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 202-209 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The role and use of simulation as a design tool in developing integrated systems where design criteria is largely unavailable is well known. This paper addresses additional simulation needs for the development of Integrated Flight/Propulsion Control Systems (IFPCS) which will improve the probability of properly interpreting simulation results. These needs are based on recent experience with power approach flying qualities evaluations of an advanced fighter configuration which incorporated Short Takeoff and Landing (STOL) technologies and earlier experiences with power approach flying qualities evaluations on the AFTI/F-16 program. The use of motion base platforms with axial and normal degrees of freedom will help in evaluating pilot coupling and workload in the presence of high frequency low amplitude axial accelerations produced by high bandwidth airspeed controllers in a gusty environment. B.W.

N85-14500*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MEASUREMENTS OF PILOT TIME DELAY AS INFLUENCED BY CONTROLLER CHARACTERISTICS AND VEHICLES TIME DELAYS
Cynthia M. Privoznik, Donald T. Berry, and Adrian G. Bartoli *In its* 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 210-221 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A study to measure and compare pilot time delay when using a space shuttle rotational hand controller and a more conventional control stick was conducted at NASA Ames Research Center's Dryden Flight Research Facility. The space shuttle controller has a palm pivot in the pitch axis. The more conventional controller used was a general-purpose engineering simulator stick that has a pivot length between that of a typical aircraft center stick and a sidestick. Measurements of the pilot's effective time delay were obtained through a first-order, closed-loop, compensatory tracking task in pitch. The tasks were implemented through a space shuttle cockpit simulator and a critical task tester device. The study consisted of 450 data runs with four test pilots and one nonpilot, and used three control stick configurations and two system delays. Results showed that the heavier conventional stick had the lowest pilot effective time delays associated with it, whereas the shuttle and light conventional sticks each had similar higher pilot time delay characteristics. It was also determined that each control stick showed an increase in pilot time delay when the total system delay was increased. Author

N85-14501*# CAE Electronics Ltd., Montreal (Quebec).
PSYCHOPHYSICAL RESEARCH IN DEVELOPMENT OF A FIBER-OPTIC HELMET MOUNTED DISPLAY Abstract only
R. V. Kruk and T. M. Longridge (USAF Human Resources Lab., Williams AFB, Ariz.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 222 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The Fiber Optic Helmet Mounted Display (FOHMD) was

conceived as an innovative solution to existing flight simulator display deficiencies. An initial (breadboard) version of the system was fabricated to permit experimentation which would help define design requirements for a more refined engineering prototype. A series of visual/human factors studies are being conducted at the USAF Human Resources Laboratory (AFHRL) Operations Training Division, Williams AFB, Arizona to determine the optimum fit of human observer operating characteristics and fiber optic helmet mounted display technology. Pilot performance within a variety of high resolution insert/binocular overlap combinations is being assessed in two classes of environment. The first two of four studies planned incorporate an air-to-air combat environment, whereas the second two studies will use a low level environment with air to ground weapons delivery. B.W.

N85-14502*# Manudyne Systems, Inc., Los Altos, Calif.
HELICOPTER PILOT PERFORMANCE FOR DISCRETE-MANEUVER FLIGHT TASKS
Robert K. Heffley, Simon M. Bourne, and William S. Hindson (Stanford Univ., Calif.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 223-232 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

This paper describes a current study of several basic helicopter flight maneuvers. The data base consists of in-flight measurements from instrumented helicopters using experienced pilots. The analysis technique is simple enough to apply without automatic data processing, and the results can be used to build quantitative matah models of the flight task and some aspects of the pilot control strategy. In addition to describing the performance measurement technqiue, some results are presented which define the aggressiveness and amplitude of maneuvering for several lateral maneuvers including turns and sidesteps. Author

N85-14503*# Northrop Corp., Hawthorne, Calif. Aircraft Div.
MAXIMUM NORMALIZED RATE AS A FLYING QUALITIES PARAMETER
E. D. Onstott, J. S. Warner, and J. Hodgkinson *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 233-258 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Discrete attitude commands have become a standard task for flying qualities evaluation and control system testing. Much pilot opinion data is now available for ground-based and in-flight simulations, but adequate performance measures and prediction methods have not been established. The Step Target Tracking Prediction method, introduced in 1978, correlated time-on-target and rms tracking data with NT-33 in-flight longitudinal simulations, but did not employ parameters easily measured in manned flight and simulation. Recent application of the Step Target Tracking Prediction method to lateral flying qualities analysis has led to a new measure of performance. This quantity, called Maximum Normalized Rate (MNR), reflects the greatest attitude rate a pilot can employ during a discrete maneuver without excessive overshoot and oscillation. MNR correlates NT-33 lateral pilot opinion ratings well, and is easily measured during flight test or simulation. Futhermore, the Step Target MNR method can be used to analyze large amplitude problems concerning rate limiting and nonlinear aerodynamics. Author

N85-14504*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
PREDICTIONS OF COCKPIT SIMULATOR EXPERIMENTAL OUTCOME USING SYSTEM MODELS
John A. Sorensen and Tsuyoshi Goka *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 259-280 refs (For primary document see N85-14487 05-54) (Contract NAS1-16135)
Avail: NTIS HC A99/MF A01 CSCL 05H

This study involved predicting the outcome of a cockpit simulator experiment where pilots used cockpit displays of traffic information (CDTI) to establish and maintain in-trail spacing behind a lead aircraft during approach. The experiments were run on the NASA Ames Research Center multicab cockpit simulator facility. Prior to the experiments, a mathematical model of the pilot/aircraft/CDTI flight system was developed which included relative in-trail and vertical dynamics between aircraft in the approach string. This model was used to construct a digital simulation of the string dynamics including response to initial position errors. The model was then used to predict the outcome of the in-trail following cockpit simulator experiments. Outcome included performance and sensitivity to different separation criteria. The experimental results were then used to evaluate the model and its prediction accuracy. Lessons learned in this modeling and prediction study are noted. Author

N85-14505*# California Univ., Davis. Dept. of Mechanical Engineering.
MULTILOOP MANUAL CONTROL OF DYNAMIC SYSTEMS
Ronald A. Hess and B. David McNally *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 281-298 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Human interaction with a simple, multiloop dynamic system in which the human's activity was systematically varied by changing the levels of automation was studied. The control loop structure resulting from the task definition parallels that for any multiloop manual control system, is considered a sterotype. Simple models of the human in the task, and upon extending a technique for describing the manner in which the human subjectively quantifies his opinion of task difficulty were developed. A man in the loop simulation which provides data to support and direct the analytical effort is presented. E.A.K.

N85-14506*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A MODEL FOR THE EFFECTIVENESS OF AIRCRAFT ALERTING AND WARNING SYSTEMS Abstract Only
Renwick E. Curry and James E. Neu (USAF) *In its* 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 299 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The effectiveness of an alerting system with a single alert was analyzed. The pilot's decision behavior is modeled by the theory of signal detection and therefore accounts for different strengths of cross check information and different pilot criteria. The model includes the effects of the alerting and warning system (CAWS) error rate; the pilot's past experience with the CAWS accuracy; his reliance on the CAWS rather than independent monitoring; missed alerts; and adoption of a minimum error or Neyman-Pearson objective rather than minimum cost objective. It is showwn that for rare events: (1) the expected cost is greatly increased if the pilot ignores the a posteriori information in the existence of an alert; (2) the expected cost is insensitive to CAWS Type 1 errors; and (3) the expected cost is sensitive to CAWS type 2 errors only when the cross check information is ambiguous. E.A.K.

N85-14507*# Gates Learjet Corp., Denver, Colo.
DEVELOPMENT AND CERTIFICATION OF A NEW STALL WARNING AND AVOIDANCE SYSTEM
W. M. Gertsen and J. D. Hawkins *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 301-326 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Several methods may be employed to improve natural stall characteristics. The method employed on all learjets to obtain improved stall characteristics is a stall warning and avoidance system that employs angle of attack vanes, an electronic computer, a control column shaker motor, and a torquer which drives the control column in a pusher mode to avoid unwanted further buildup of angle of attack. The new system was developed with changes that improve system response with no performance penalty or increase in turbulence sensitivity. The following changes were made included modified system time constants and (alpha)

time rate of change of vane angle dead zone and the addition of an alpha signal limiter and an alpha cut out below a specified angle of attack. E.A.K.

N85-14508*# Massachusetts Inst. of Tech., Cambridge. Man-Machine Systems Lab.
EVALUATION OF FUZZY RULEMAKING FOR EXPERT SYSTEMS FOR FAILURE DETECTION
Frank Laritz and Thomas B. Sheridan *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 327-336 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Computer aids in expert systems were proposed to diagnose failures in complex systems. It is shown that the fuzzy set theory of Zadeh offers a new perspective for modeling for humans thinking and language use. It is assumed that real expert human operators of aircraft, power plants and other systems do not think of their control tasks or failure diagnosis tasks in terms of control laws in differential equation form, but rather keep in mind a set of rules of thumb in fuzzy form. Fuzzy set experiments are described. E.A.K.

N85-14509*# Ohio State Univ., Columbus. Dept. of Industrial and Systems Engineering.
THE ROLE OF KNOWLEDGE STRUCTURES IN FAULT DIAGNOSIS Abstract Only
Philip J. Smith, Walter C. Giffin, Thomas H. Rockwell, and Mark E. Thomas *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 337-338 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The use of human memory and knowledge structures to direct fault diagnosis performance was investigated. The performances of 20 pilots with instrument flight ratings were studied in a fault diagnosis task. The pilots were read a scenario which described flight conditions under which the symptoms which are indicative of a problem were detected. They were asked to think out loud as they requested and interpreted various pieces of information to diagnose the cause of the problem. Only 11 of the 20 pilots successfully diagnosed the problem. Pilot performance on this fault diagnosis task was modeled in the use of domain specific knowledge organized in a frame system. Eighteen frames, with a common structure, were necessary to account for the data from all twenty subjects. E.A.K.

N85-14510*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF PART-SIMULATION OF WEIGHTLESSNESS ON HUMAN CONTROL OF BILATERAL TELEOPERATION: NEUROMOTOR CONSIDERATIONS
Kevin Corker and Antal Bejczy *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 339-360 refs (For primary document see N85-14487 05-54)
(Contract NAS7-918)
Avail: NTIS HC A99/MF A01 CSCL 05H

The effect of weightlessness on the human operator's performance in force reflecting position control of remote manipulators was investigated. A gravity compensation system was developed to simulate the effect of weightlessness on the operator's arm. A universal force reflecting hand controller (FRHC) and task simulation software were employed. Two experiments were performed because of anticipated disturbances in neuromotor control specification on the human operator in an orbital control environment to investigate: (1) the effect of controller stiffness on the attainment of a learned terminal position in the three dimensional controller space, and (2) the effect of controller stiffness and damping on force tracking of the contour of a simulated three dimensional cube using the part simulation of weightless conditions. The results support the extension of neuromotor control models, which postulate a stiffness balance encoding of terminal position, to three dimensional motion of a multilink system, confirm the existence of a disturbance in human manual control performance under gravity compensated conditions, and suggest techniques for compensation of weightlessness induced performance decrement through appropriate specification of hand controller response characteristics. These techniques are based on the human control model. E.A.K.

N85-14511*# Massachusetts Inst. of Tech., Cambridge. Man-Machine System Lab.
REVIEW OF TELEOPERATOR RESEARCH
Thomas B. Sheridan *In* NASA. Ames Research Lab 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 361-366 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A predictor display to overcome time lag problems with remote control systems is discussed. The video picture is a (necessarily) time-delayed picture from the remote location, generated as a coherent frame (snapshot) so that all picture elements in a single scan are delayed the same. The computer-generated graphics is a line drawing of the present configuration of the manipulator arm, vehicle or other device. The latter is generated by using the same control signals which are sent to the remote manipulator (device) to drive a computer model of it. The computer model is drawn on the video display in exactly the same location as where it will actually be after a one-way time delay and where it will be seen to be on the video after one round-trip time delay. If one waits at least one round-trip delay without moving, both the graphics model and the video picture of the manipulator (device) are seen to coincide. The predictor technque proved to work well and was shown for time delays in the 1-3 second range to reduce completion times for a variety of manipulation tasks by 50-150 percent reliably. R.J.F.

N85-14512*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VISUAL SYSTEMS FOR REMOTELY CONTROLLED VEHICLES
Terrence Rezek *In its* 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 367-396 (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The Variable Acuity Remote Viewing System is discussed. It was conceived as a technique for resolving the field of view/ resolution/ bandwidth tradeoffs that exist in remote viewing systems. This system is based on the fact that integration of the human eye acuity function shows only about 130,000 pixels are required to fully support the human vision. This quantity is well within the capabilities of conventional video systems. The technique utilizes a non-linear optical system in both the sensing and display equipment. The non-linearity is achieved by a special lens which translates a uniform pixel array on its image plane into the object field as a variable angular array. This lens will record the same angular detail the eye would see when viewing the same scene and compress this detail into a uniform matrix of equal sized picture elements on its image plane. This image can be scanned with a broadcast quality tv having a 525 line raster scan. Conventional transmission equipment can then also be used to send the image information to a remote location. When received, the image is projected by a light valve projector onto a hemispherical screen by an identical non-linear lens. R.J.F.

N85-14513*# Massachusetts Inst. of Tech., Cambridge. Man-Machine Systems Lab.
MEASURING WORKLOAD DIFFERENCES BETWEEN SHORT-TERM MEMORY AND LONG-TERM MEMORY SCENARIOS IN A SIMULATED FLIGHT ENVIRONMENT
Scott L. Berg and Thomas B. Sheridan *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 397-416 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Four highly experienced Air Force pilots each flew four simulated flight scenarios. Two scenarios required a great deal of aircraft maneuvering. The other two scenarios involved less maneuvering, but required remembering a number of items. All scenarios were designed to be equaly challenging. Pilot's Subjective Ratings for Activity-level, Complexity, Difficulty, Stress, and

Workload were higher for the manuevering scenarios than the memory scenarios. At a moderate workload level, keeping the pilots active resulted in better aircraft control. When required to monitor and remember items, aircraft control tended to decrease. Pilots tended to weigh information about the spatial positioning and performance of their aircraft more heavily than other items.
Author

N85-14514*# Toronto Univ. (Ontario). Dept. of Industrial Engineering.
VISUAL ATTENTION TO RADAR DISPLAYS
Neville Moray, Mark Richards, and Corinne Brophy *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 417-430 refs Sponsored in part by United Kingdom Ministry of Defense (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A model is described which predicts the allocation of attention to the features of a radar display. It uses the growth of uncertainty and the probability of near collision to call the eye to a feature of the display. The main source of uncertainty is forgetting following a fixation, which is modelled as a two dimensional diffusion process. The model was used to predict information overload in intercept controllers, and preliminary validation obtained by recording eye movements of intercept controllers in simulated and live (practice) interception. R.J.F.

N85-14515*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
POPCORN: A SUPERVISORY CONTROL SIMULATION FOR WORKLOAD AND PERFORMANCE RESEARCH
Sandra G. Hart, Vernol Battiste (San Jose State Univ., Calif.), and Patrick T. Lester (San Jose State Univ., Calif.) *In its* 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 431-454 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A multi-task simulation of a semi-automatic supervisory control system was developed to provide an environment in which training, operator strategy development, failure detection and resolution, levels of automation, and operator workload can be investigated. The goal was to develop a well-defined, but realistically complex, task that would lend itself to model-based analysis. The name of the task (POPCORN) reflects the visual display that depicts different task elements milling around waiting to be released and pop out to be performed. The operator's task was to complete each of 100 task elements that ere represented by different symbols, by selecting a target task and entering the desired a command. The simulated automatic system then completed the selected function automatically. Highly significant differences in performance, strategy, and rated workload were found as a function of all experimental manipulations (except reward/penalty). R.J.F.

N85-14516*# Search Technology, Inc., Norcross, Ga.
PSYCHOLOGICAL ISSUES IN ONLINE ADAPTIVE TASK ALLOCATION
Nancy M. Morris, William B. Rouse, Sharon L. Ward (AF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio), and Paul R. Frey *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 455-466 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A02/MF A01 CSCL 05H

Adaptive aiding is an idea that offers potential for improvement over many current approaches to aiding in human-computer systems. The expected return of tailoring the system to fit the user could be in the form of improved system performance and/or increased user satisfaction. Issues such as the manner in which information is shared between human and computer, the appropriate division of labor between them, and the level of autonomy of the aid are explored. A simulated visual search task was developed. Subjects are required to identify targets in a moving display while performing a compensatory sub-critical tracking task. By manipulating characteristics of the situation such as imposed task-related workload and effort required to communicate with the computer, it is possible to create conditions in which interaction with the computer would be more or less desirable. The results of preliminary research using this experimental scenario are presented, and future directions for this research effort are discussed. R.J.F.

N85-14517*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
USE OF LINEAR PERSPECTIVE SCENE CUES IN A SIMULATED HEIGHT REGULATION TASK
William H. Levison and Rik Warren (AFAMRL/HEF, Wright-Patterson AFB, Ohio) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 467-490 refs (For primary document see N85-14487 05-54)
(Contract F33615-81-C-0515)
Avail: NTIS HC A99/MF A01 CSCL 05H

As part of a long-term effort to quantify the effects of visual scene cuing and non-visual motion cuing in flight simulators, an experimental study of the pilot's use of linear perspective cues in a simulated height-regulation task was conducted. Six test subjects performed a fixed-base tracking task with a visual display consisting of a simulated horizon and a perspective view of a straight, infinitely-long roadway of constant width. Experimental parameters were (1) the central angle formed by the roadway perspective and (2) the display gain. The subject controlled only the pitch/height axis; airspeed, bank angle, and lateral track were fixed in the simulation. The average RMS height error score for the least effective display configuration was about 25% greater than the score for the most effective configuration. Overall, larger and more highly significant effects were observed for the pitch and control scores. Model analysis was performed with the optimal control pilot model to characterize the pilot's use of visual scene cues, with the goal of obtaining a consistent set of independent model parameters to account for display effects. M.G.

N85-14518*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Aerospace Human Factors Research Div.
COCKPIT WINDOW EDGE PROXIMITY EFFECTS ON JUDGEMENTS OF HORIZON VERTICAL DISPLACEMENT
Richard F. Haines *In its* 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 491-514 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A02/MF A01 CSCL 05H

To quantify the influence of a spatially fixed edge on vertical displacement threshold, twenty-four males (12 pilots, 12 non-pilots) were presented a series of forced choice, paired comparison trials in which a 32 deg arc wide, thin, luminous horizontal stimulus line moved smoothly downward through five angles from a common starting position within a three second-long period. The five angles were 1.4, 1.7, 2, 2.3, and 2.6 deg. Each angle was presented paired with itself and the other four angles in all combinations in random order. For each pair of trials the observer had to choose which trial possessed the largest displacement. A confidence response also was made. The independent variable was the angular separation between the lower edge of a stable 'window' aperture through which the stimulus was seen to move and the lowest position attained by the stimulus. It was found that vertical displacement accuracy is inversely related to the angle separating the stimulus and the fixed window edge ($p = .05$). In addition, there is a strong tendency for pilot confidence to be lower than that of non-pilots for each of the three angular separations. These results are discussed in erms of selected cockpit features and as they relate to how pilots judge changes in aircraft pitch attitude.
M.G.

N85-14519*# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
MEAN AND RANDOM ERRORS OF VISUAL ROLL RATE PERCEPTION FROM CENTRAL AND PERIPHERAL VISUAL DISPLAYS
J. C. vanderVaart and R. J. A. W. Hosman *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 515-530 refs (For primary document see N85-14487

05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

A large number of roll rate stimuli, covering rates from zero to plus or minus 25 deg/sec, were presented to subjects in random order at 2 sec intervals. Subjects were to make estimates of magnitude of perceived roll rate stimuli presented on either a central display, on displays in the peripheral ield of vision, or on all displays simultaneously. Response was by way of a digital keyboard device, stimulus exposition times were varied. The present experiment differs from earlier perception tasks by the same authors in that mean rate perception error (and standard deviation) was obtained as a function of rate stimulus magnitude, whereas the earlier experiments only yielded mean absolute error magnitude. Moreover, in the present experiment, all stimulus rates had an equal probability of occurrence, whereas the earlier tests featured a Gaussian stimulus probability density function. Results yield a good illustration of the nonlinear functions relating rate presented to rate perceived by human observers or operators.
Author

N85-14520*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIRECTION JUDGEMENT ERRORS IN PERSPECTIVE DISPLAYS
Michael Wallace McGreevy and Stephen R. Ellis *In its* 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 531-550 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Spatial information transfer characteristics of perspective situation displays were investigated by having eight subjects judge the directions of displayed targets relative to a fixed position in the center of computer generated perspective scenes. Their errors in judging azimuth angles varied sinusoidally with the azimuth of the targets. Errors alternated between clockwise and counterclock wise from one direction quadrant to the next. As the perspective geometry was varied between telephoto lens and wide angle lens views, the direction of error gradually reversed in all quadrants. The results can be explained by systematic differences between the three-dimensional stimulus angles and the perspective projections of those angles onto the display screen. M.G.

N85-14521*# Cornell Univ., Ithaca, N.Y. Dept. of Psychology.
THE INTERACTION OF FOCUSED ATTENTION WITH FLOW-FIELD SENSITIVITY
Tom Stoffregen *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 551-558 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Two studies were performed to determine whether a subject's response to naturalistic optical flow specifying egomotion would be affected by a concurrent attention task. In the first study subjects stood in a moving room in which various areas of the optical flow generated by room movement were visible. Subjects responded to room motion with strong compensatory sway when the entire room was visible. When the side walls of the room were completely obscured by stationary screens, leaving only the front wall visible, sway was significantly reduced, though it remained greater than in an eyes-closed control. In Exp. 2 subjects were presented with either the full room (large sway response) or the room with only the front wall visible (moderate response), each in combination with either a hard or easy verbal addition task. Preliminary results show that swaying in the fully visible room and in the room with only the front wall visible increased when combined with either the hard or easy tasks. These preliminary results suggest that at the least the pick-up of optical flow specifying egomotion is not affected by concurrent attentional activity. M.G.

N85-14522*# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ACCURACY OF SYSTEM STEP RESPONSE ROLL MAGNITUDE ESTIMATION FROM CENTRAL AND PERIPHERAL VISUAL DISPLAYS AND SIMULATOR COCKPIT MOTION
R. J. A. W. Hosman and J. C. vanderVaart *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 559-574 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

An experiment to investigate visual roll attitude and roll rate perception is described. The experiment was also designed to assess the improvements of perception due to cockpit motion. After the onset of the motion, subjects were to make accurate and quick estimates of the final magnitude of the roll angle step response by pressing the appropriate button of a keyboard device. The differing time-histories of roll angle, roll rate and roll acceleration caused by a step response stimulate the different perception processes related the central visual field, peripheral visual field and vestibular organs in different, yet exactly known ways. Experiments with either of the visual displays or cockpit motion and some combinations of these were run to asses the roles of the different perception processes. Results show that the differences in response time are much more pronounced than the differences in perception accuracy. M.G.

N85-14523*# Toronto Univ. (Ontario). Dept. of Industrial Engineering.
FITTS' LAW? A TEST OF THE RELATIONSHIP BETWEEN INFORMATION LOAD AND MOVEMENT PRECISION
Mathew Zalaski and Penny Sanderson *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 575-584 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The independence of information load (Hick's Law) and movement precision (Fitts' Law) was tested using additive factors methodology. Subjects were required to classify stimuli according to a decision rule with a variable entropy. The stimuli were presented in the center of the CRT screen. In response, subjects had to move a cursor from a starting point near the stimulus to the appropriate target. The precision of the response movement was varied by manipulating the ratio of the radius of the annulus to the width of the target area. The dependent measure was elapsed time between onset of the stimulus and completion of the response movement. Independence of the Hick's Law and Fitts' Law components of the reaction time was tested with an analysis of variance. Presence of an interaction would suggest that a decision stage and a response stage are dependent, and cannot be considered discrete steps in a serial process. Author

N85-14524*# Ohio State Univ., Columbus.
A PRODUCTION SYSTEM MODEL OF CAPTURING REACTIVE MOVING TARGETS M.S. Thesis
Richard J. Jagacinski, Brian D. Plamondon, and Richard A. Miller *In* NASA. Ames Research Center 20th Ann. Conf. of Manual Control, Vol. 1 Sep. 1984 p 585-600 refs (For primary document see N85-14487 05-54)
(Grants NAG2-195; AF-AFOSR-3697-78)
Avail: NTIS HC A99/MF A01 CSCL 05H

Subjects manipulated a control stick to position a cursor over a moving target that reacted with a computer-generated escape strategy. The cursor movements were described at two levels of abstraction. At the upper level, a production system described transitions among four modes of activity; rapid acquisition, close following, a predictive mode, and herding. Within each mode, differential equations described trajectory-generating mechanisms. A simulation of this two-level model captures the targets in a manner resembling the episodic time histories of human subjects.
Author

N85-14525*# California Univ., Berkeley. Neurology Unit.
INVERSE MODELLING TO OBTAIN HEAD MOVEMENT CONTROLLER SIGNAL
Won Soo Kim, Sang Hyo Lee (Kwang Woon Univ., Seoul, Korea), Blake Hannaford, and Lawrence Stark *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 601-620 refs Sponsored in part by NIH, and by Ministry of Education, Korea (For primary document see N85-14487 05-54)
(Contract NCC-2-86)

Avail: NTIS HC A99/MF A01 CSCL 05H

Experimentally obtained dynamics of time-optimal, horizontal head rotations have previously been simulated by a sixth order, nonlinear model driven by rectangular control signals. Electromyography (EMG) recordings have spects which differ in detail from the theoretical rectangular pulsed control signal. Control signals for time-optimal as well as sub-optimal horizontal head rotations were obtained by means of an inverse modelling procedures. With experimentally measured dynamical data serving as the input, this procedure inverts the model to produce the neurological control signals driving muscles and plant. The relationships between these controller signals, and EMG records should contribute to the understanding of the neurological control of movements. Author

N85-14526*# Performance Measurement Associates, Inc., Vienna, Va.

A CONTROL MODEL: INTERPRETATION OF FITTS' LAW

Edward M. Connelly *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 621-642 refs (For primary document see N85-14487 05-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

The analytical results for several models are given: a first order model where it is assumed that the hand velocity can be directly controlled, and a second order model where it is assumed that the hand acceleration can be directly controlled. Two different types of control-laws are investigated. One is linear function of the hand error and error rate; the other is the time-optimal control law. Results show that the first and second order models with the linear control-law produce a movement time (MT) function with the exact form of the Fitts' Law. The control-law interpretation implies that the effect of target width on MT must be a result of the vertical motion which elevates the hand from the starting point and drops it on the target at the target edge. The time optimal control law did not produce a movement-time formula simular to Fitt's Law. R.S.F.

N85-14527*# Ohio State Univ., Columbus.

THE IMPACT OF PICTORIAL DISPLAY ON OPERATOR LEARNING AND PERFORMANCE M.S. Thesis

Richard A. Miller, Lisa J. Messing, and Richard J. Jagacinski *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 643-662 refs (For primary document see N85-14487 05-54)

(Grant NAG2-195)
Avail: NTIS HC A99/MF A01 CSCL 05H

The effects of pictorially displayed information on human learning and performance of a simple control task were investigated. The controlled system was a harmonic oscillator and the system response was displayed to subjects as either an animated pendulum or a horizontally moving dot. Results indicated that the pendulum display did not effect performance scores but did significantly effect the learning processes of individual operators. The subjects with the pendulum display demonstrated more vertical internal models early in the experiment and the manner in which their internal models were tuned with practice showed increased variability between subjects. Author

N85-14528*# Rockwell International Corp., Los Angeles, Calif. Human Engineering/Biomedical.

DOES MCKUER'S LAW HOLD FOR HEART RATE CONTROL VIA BIOFEEDBACK DISPLAY?

Barbara Jex Courter and Henry R. Jex *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 663-670 (For primary document see N85-14487 05-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Some persons can control their pulse rate with the aid of a biofeedback display. If the biofeedback display is modified to show the error between a command pulse-rate and the measured rate, a compensatory (error correcting) heart rate tracking control loop can be created. The dynamic response characteristics of this control loop when subjected to step and quasi-random disturbances were measured. The control loop includes a beat-to-beat cardiotachmeter differenced with a forcing function from a quasi-random input generator; the resulting error pulse-rate is displayed as feedback. The subject acts to null the displayed pulse-rate error, thereby closing a compensatory control loop. McRuer's Law should hold for this case. A few subjects already skilled in voluntary pulse-rate control were tested for heart-rate control response. Control-law properties are derived, such as: crossover frequency, stability margins, and closed-loop bandwidth. These are evaluated for a range of forcing functions and for step as well as random disturbances. R.S.F.

N85-14529*# California Univ., Berkeley. Dept. of Engineering Science.

NEW USES FOR SENSITIVITY ANALYSIS: HOW DIFFERENT MOVEMENT TASKS EFFECT LIMB MODEL PARAMETER SENSITIVITY

Jack M. Winters and Lawrence Stark *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 671-698 refs (For primary document see N85-14487 05-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

Original results for a newly developed eight-order nonlinear limb antagonistic muscle model of elbow flexion and extension are presented. A wider variety of sensitivity analysis techniques are used and a systematic protocol is established that shows how the different methods can be used efficiently to complement one another for maximum insight into model sensitivity. It is explicitly shown how the sensitivity of output behaviors to model parameters is a function of the controller input sequence, i.e., of the movement task. When the task is changed (for instance, from an input sequence that results in the usual fast movement task to a slower movement that may also involve external loading, etc.) the set of parameters with high sensitivity will in general also change. Such task-specific use of sensitivity analysis techniques identifies the set of parameters most important for a given task, and even suggests task-specific model reduction possibilities. A.R.H.

N85-14530*# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

SUPPRESSION OF BIODYNAMIC INTERFERENCE BY ADAPTIVE FILTERING

M. Velger, S. J. Merhav, and A. J. Grunwald *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 699-718 refs (For primary document see N85-14487 05-54)

(Contract F33615-82-C-0520)
Avail: NTIS HC A99/MF A01 CSCL 05H

Preliminary experimental results obtained in moving base simulator tests are presented. Both for pursuit and compensatory tracking tasks, a strong deterioration in tracking performance due to biodynamic interference is found. The use of adaptive filtering is shown to substantially alleviate these effects, resulting in a markedly improved tracking performance and reduction in task difficulty. The effect of simulator motion and of adaptive filtering on human operator describing functions is investigated. Adaptive filtering is found to substantially increase pilot gain and cross-over frequency, implying a more tight tracking behavior. The adaptive filter is found to be effective in particular for high-gain proportional dynamics, low display forcing function power and for pursuit tracking task configurations. A.R.H.

N85-14531*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

ACTIVE STICKS: A NEW DIMENSION IN CONTROLLER DESIGN

D. W. Repperger and D. McCollor (Raytheon Service Corp.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 719-734 refs (For primary document see N85-14487 05-54)

Avail: NTIS HC A99/MF A01 CSCL 05H

A smart stick controller was built which actively produces a force to interact with the subject's hand and to aid in tracking. When the human tracks in this situation, the man-machine system can be viewed as the combination of two closed loop feedback paths. The inner loop occurs as a result of a tactile information

channel effecting the man-controller interaction through force with this stick in the active mode (the stick generates a force) and the passive mode (the stick not generating a force) are reported. The most noteworthy observation is a significant increase in apparent neuromotor bandwidth and consequently better tracking performance. A.R.H.

N85-14532*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
MODELS FOR THE EFFECTS OF G-SEAT CUING ON ROLL-AXIS TRACKING PERFORMANCE
William H. Levison, Grant R. McMillan (AFMRL), and Edward A. Martin (ASD) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 735-752 refs (For primary document see N85-14487 05-54)
(Contract F33615-81-C-0515)
Avail: NTIS HC A99/MF A01 CSCL 05H

Including whole-body motion in a flight simulator improves performance for a variety of tasks requiring a pilot to compensate for the effects of unexpected disturbances. A possible mechanism for this improvement is that whole-body motion provides high derivative vehicle state information whic allows the pilot to generate more lead in responding to the external disturbances. During development of motion simulating algorithms for an advanced g-cuing system it was discovered that an algorithm based on aircraft roll acceleration producted little or no performance improvement. On the other hand, algorithms based on roll position or roll velocity produced performance equivalent to whole-body motion. The analysis and modeling conducted at both the sensory system and manual control performance levels to explain the above results are described. Author

N85-14533*# University of Southern California, Los Angeles. Dept. of Safety Science.
AN ANALYSIS OF KINETIC RESPONSE VARIABILITY
P. A. Hancock, L. G. Carlton (Illinois Univ., Champaign), and K. M. Newell (Illinois Univ., Champaign) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 753-760 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Studies evaluating variability of force as a function of absolute force generated are synthesized. Inconsistencies in reported estimates of this relationship are viewed as a function of experimental constraints imposed. Typically, within-subject force variability increases at a negative accelerating rate with equal increments in force produced. Current pulse-step and impulse variability models are unable to accommodate this description, although the notion of efficiency is suggested as a useful construct to explain the description outlined. Author

N85-14534*# Kon-Kuk Univ., Seoul (South Korea). Dept. of Electrical Engineering.
EFFECTS OF EXTERNAL LOADS ON HUMAN HEAD MOVEMENT CONTROL SYSTEMS
Moon-Hyon Nam and Ok-Man Choi *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 1 Sep. 1984 p 761-762 refs (For primary document see N85-14487 05-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The central and reflexive control strategies underlying movements were elucidated by studying the effects of external loads on human head movement control systems. Some experimental results are presented on dynamic changes weigh the addition of aviation helmet (SPH4) and lead weights (6 kg). Intended time-optimal movements, their dynamics and electromyographic activity of neck muscles in normal movements, and also in movements made with external weights applied to the head were measured. It was observed that, when the external loads were added, the subject went through complex adapting processes and the head movement trajectory and its derivatives reached steady conditions only after transient adapting period. The steady adapted state was reached after 15 to 20 seconds (i.e., 5 to 6 movements). A.R.H.

N85-14535*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TWENTIETH ANNUAL CONFERENCE ON MANUAL CONTROL, VOLUME 2
Sandra G. Hart, comp. and Earl J. Hartzell, comp. Sep. 1984 423 p refs Conf. held at Moffett Field, Calif., 12-14 Jun. 1984 2 Vol.
(NASA-CP-2341-Vol-2; A-9879-Vol-2; NAS 1.55:2341-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 05H

Volume II contains thirty two complete manuscripts and five abstracts. The topics covered include the application of event-related brain potential analysis to operational problems, the subjective evaluation of workload, mental models, training, crew interaction analysis, multiple task performance, and the measurement of workload and performance in simulation. For individual titles, see N85-14536 through N85-14568.

N85-14536*# Illinois Univ., Urbana. Dept. of Psychology.
ERPS TO MONITOR NON-CONSCIOUS MENTATION
Emanuel Donchin *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 1-20 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

Event Related Brain Potentials (or ERPs) are extracted from the EEG that can be recorded between a pair of electrodes placed on a person's scalp. The EEG is recorded as a continual fluctuation in voltage. It is the results of the integration of the potential fields generated by a multitude of neuronal ensembles that are active as the brain goes about its business. Within this ongoing signal it is possible to distinguish voltage fluctuations that are triggered in neural structures by the occurrence of specific events. This activity, evoked as it is by an external event, is known as the Evoked, or Event Related, Potential. The ERPs provide a unique opportunity to monitor non-conscious mentation. The inferences that can be based on ERP data are described and the limits of these inferences are emphasized. This, however, will not be an exhaustive review of the use of ERPs in Engineering Psychology. The application, its scope, and its limitations will be illustrated by means of one example. This example is preceded by a brief technical introduction to the methodology used in the study of ERPs. The manner in which ERPs are used to study cognition is described. B.W.

N85-14537*# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
PERFORMANCE ENHANCEMENTS UNDER DUAL-TASK CONDITIONS
Arthur F. Kramer, Christopher D. Wickens, and Emanuel Donchin *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 21-36 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

Research on dual-task performance has been concerned with delineating the antecedent conditions which lead to dual-task decrements. Capacity models of attention, which propose that a hypothetical resource structure underlies performance, have been employed as predictive devices. These models predict that tasks which require different processing resources can be more successfully time shared than tasks which require common resources. The conditions under which such dual-task integrality can be fostered were assessed in a study in which three factors likely to influence the integrality between tasks were manipulated: inter-task redundancy, the physical proximity of tasks and the task relevant objects. Twelve subjects participated in three experimental sessions in which they performed both single and dual-tasks. The primary task was a pursuit step tracking task. The secondary tasks required the discrimination between different intensities or different spatial positions of a stimulus. The results are discussed in terms of a model of dual-task integrality. B.W.

N85-14538*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
IN SEARCH OF A VISUAL-CORTICAL DESCRIBING FUNCTION: A SUMMARY OF WORK IN PROGRESS

Andrew M. Junker and Karen J. Peio (Systems Research Labs, Inc., Dayton, Ohio) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 37-54 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

The thrust of the present work is to explore the utility of using a sum of sinusoids (seven or more) to obtain an evoked response and, furthermore, to see if the response is sensitive to changes in cognitive processing. Within the field of automatic control system technology, a mathematical input/output relationship for a sinusoidally stimulated nonlinear system is defined as describing function. Applying this technology, sum of sines inputs to yield describing functions for the visual-cortical response have been designed. What follows is a description of the method used to obtain visual-cortical describing functions. A number of measurement system redesigns were necessary to achieve the desired frequency resolution. Results that guided and came out of the redesigns are presented. Preliminary results of stimulus parameter effects (average intensity and depth of modulation) are also shown. B.W.

N85-14539*# Technion - Israel Inst. of Tech., Haifa.
MEASUREMENT OF WORKLOAD: PHYSICS, PSYCHOPHYSICS, AND METAPHYSICS Abstract Only
Daniel Gopher *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 55 (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

The present paper reviews the results of two experiments in which workload analysis was conducted based upon performance measures, brain evoked potentials and magnitude estimations of subjective load. The three types of measures were jointly applied to the description of the behavior of subjects in a wide battery of experimental tasks. Data analysis shows both instances of association and dissociation between types of measures. A general conceptual framework and methodological guidelines are proposed to account for these findings. Author

N85-14540*# Illinois Univ., Urbana-Champaign. Dept. of Psychology.
SUBJECTIVE WORKLOAD ASSESSMENT AND VOLUNTARY CONTROL OF EFFORT IN A TRACKING TASK
Michael A. Vidulich and Christopher D. Wickens *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 57-72 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

A manual control tracking task was manipulated along two dimensions: (1) control order and (2) forcing function bandwidth. In the first phase of the experiment subjective workload assessments were collected. It was found that subjective assessments of workload were closely associated with performance in the case of increasing control order, but not in the case of increasing bandwidth. This was interpreted as indicating that subjective workload assessments are most appropriate for the study of increasing difficulty centered in response selection processes as opposed to response execution processes. In the second phase of the experiment the subjects were asked to voluntarily limit the effort they applied in the performance of the tracking task. The results indicate that the subjects were quite facile in doing this. However, comparison of these data to the findings of other studies that manipulated effort via dual-task biasing indicate that effort manipulation is much more potent in a single-task configuration. This finding is discussed in terms of multiple resource theories of attentional capacity. The utility of an analysis of covariance procedure in studying the relationships between subjective ratings and performance is highlighted. Author

N85-14541*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Vehicle Simulation Lab.
DECISION TREE RATING SCALES FOR WORKLOAD ESTIMATION: THEME AND VARIATIONS
Walter W. Wietwille, Julie H. Skipper, and Christine A. Rieger (Hughes Aircraft Co., Fullerton, Calif.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 73-84 refs (For primary document see N85-14535 05-54)
(Grant NAG2-17)
Avail: NTIS HC A18/MF A01 CSCL 05H

The modified Cooper-Harper (MCH) scale has been shown to be a sensitive indicator of workload in several different types of aircrew tasks. The MCH scale was examined to determine if certain variations of the scale might provide even greater sensitivity and to determine the reasons for the sensitivity of the scale. The MCH scale and five newly devised scales were studied in two different aircraft simulator experiments in which pilot loading was treated as an independent variable. Results indicate that while one of the new scales may be more sensitive in a given experiment, task dependency is a problem. The MCH scale exhibits consistent sensitivity and remains the scale recommended for general use. The results of the rating scale experiments are presented and the questionnaire results which were directed at obtaining a better understanding of the reasons for the relative sensitivity of the MCH scale and its variations are described. R.S.F.

N85-14542*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ASSESSING THE SUBJECTIVE WORKLOAD OF DIRECTIONAL ORIENTATION TASKS
Ronald C. Miller (Informatics General Corp., Palo Alto, Calif.) and Sandra G. Hart *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 85-96 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

The impact of various flight-related tasks on the workload imposed by the requirement to compute new headings, course changes, and reciprocal headings was investigated. Eight pilots were presented with a series of heading-change tasks in a laboratory setting. Two levels of difficulty of each of three tasks were presented verbally and spatially. Performance was measured by evaluating the speed and accuracy of the responses. The subjective responses and objective measures of performance reflected a strong association between subjective experience and objective behavior. The reciprocal calculations were performed quickly and accurately throughout and were considered to be minimally loading. Subjective workload, percent correct and response times for the two course-change tasks varied significantly as a function of level of difficulty and display format, with no discernable speed/accuracy trade off. R.S.F.

N85-14543*# Arizona State Univ., Tempe. Dept. of Psychology.
CLASSIFICATION SYSTEMS FOR INDIVIDUAL DIFFERENCES IN MULTIPLE-TASK PERFORMANCE AND SUBJECTIVE ESTIMATES OF WORKLOAD
Diane L. Damos *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 97-104 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

Human factors practitioners often are concerned with mental workload in multiple-task situations. Investigations of these situations have demonstrated repeatedly that individuals differ in their subjective estimates of workload. These differences may be attributed in part to individual differences in definitions of workload. However, after allowing for differences in the definition of workload, there are still unexplained individual differences in workload ratings. The relation between individual differences in multiple-task performance, subjective estimates of workload, information processing abilities, and the Type A personality trait were examined. Author

N85-14544*# Toronto Univ. (Ontario). Dept. of Psychology.
MENTAL MODELS OF INVISIBLE LOGICAL NETWORKS
Penelope Sanderson *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 105-120 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

Subjects were required to discover the structure of a logical

network whose links were invisible. Network structure had to be inferred from the behavior of the components after a failure. It was hypothesized that since such failure diagnosis tasks often draw on spatial processes, a good deal of spatial complexity in the network should affect network discovery. Results show that the ability to discover the linkages in the network is directly related to the spatial complexity of the pathway described by the linkages. This effect was generally independent of the amount of evidence available to subjects about the existence of the link. These results raise the question of whether inferences about spatially complex pathways were simply not made, or whether they were made but not retained because of a high load on memory resources. Author

N85-14545*# Technion - Israel Inst. of Tech., Haifa.
THE REPRESENTATION OF ACTION PLANS IN LONG TERM MEMORY Abstract Only
Gopher N. Fussfeld, W. Koenig (Illinois Univ., Champaign), and D. Karis (Illinois Univ., Champaign) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 121-122 (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

A sequence of experiments conducted on a two hand chord typewriter, to compare the efficiency of different coding principles employed to associate letters with their chord productions is described. This keyboard represents an effort to identify effective alternatives to the existing typewriter. It consists of two seperate 5-key panels (one for each hand), and letters are entered by typing chords composed of one to five fingers. Each panel is capable of producing the full alphabet. One group of experiments was designed to separate between perceptual and motor factors in the acivation of single letter chords. The results underline the importance of perceptual factors in the activation of motor plans. The complexity of the patterns employed to represent letters was shown to account for 50 percent of variance in the typing speeds of single letters. The theoretical implications of these results are discussed in relation to a vision based theory of action plans. M.G.

N85-14546*# Search Technology, Inc., Norcross, Ga.
ON LOOKING INTO THE BLACK BOX: PROSPECTS AND LIMITS IN THE SEARCH FOR MENTAL MODELS Abstract Only
William B. Rouse and Nancy M. Morris *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 123-124 (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

To place the arguments advanced in this paper in alternative points of view with regard to mental models are reviewed. Use of the construct in areas such as neural information processing, manual control, decision making, problem solving, and cognitive science are discussed. Also reviewed are several taxonomies of mental models. The available empirical evidence for answering questions concerning the nature and usage of mental models is then discussed. A variety of studies are reviewed where the type and form of humans' knowledge have been manipulated. Also considered are numerous transfer of training studies whose results provide indirect evidence of the nature of mental models. The alternative perspectives considered and the spectrum of empirical evidence are combined to suggest a framework within which research on mental models can be viewed. By considering interactions of dimensions of this framework, the most salient unanswered questions can be identified. M.G.

N85-14547*# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
ISSUES IN DEVELOPING A NORMATIVE DESCRIPTIVE MODEL FOR DYADIC DECISION MAKING Abstract Only
Daniel Serfaty and David L. Kleinman *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 125 (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

Most research in modelling human information processing and decision making has been devoted to the case of the single human operator. In the present effort, concepts from the fields of organizational behavior, engineering psychology, team theory and mathematical modelling are merged in an attempt to consider first the case of two cooperating decisionmakers (the Dyad) in a multi-task environment. Rooted in the well-known Dynamic Decision Model (DDM), the normative descriptive approach brings basic cognitive and psychophysical characteristics inherent to human behavior into a team theoretic analytic framework. An experimental paradigm, involving teams in dynamic decision making tasks, is designed to produce the data with which to build the theoretical model. Author

N85-14548*# Massachusetts Inst. of Tech., Cambridge.
GETTING MENTAL MODELS AND COMPUTER MODELS TO COOPERATE Abstract Only
Thomas B. Sheridan, James Roseborough, Leon Charney, and Max Mendel *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 127 (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

A qualitative theory of supervisory control is outlined wherein the mental models of one or more human operators are related to the knowledge representations within automatic controllers (observers, estimators) and operator decision aids (expert systems, advice-givers). Methods of quantifying knowledge and the calibration of one knowledge representation to another (human, computer, or objective truth) are discussed. Ongoing experiments in the use of decision aids for exploring one's own objective function or exploring system constraints and control strategies are described. Author

N85-14549*# Psycho-Linguistic Research Associates, Menlo Park, Calif.
A COMPARATIVE STUDY OF ALTERNATIVE CONTROLS AND DISPLAYS FOR BY THE SEVERELY PHYSICALLY HANDICAPPED
Douglas Williams, Carol Simpson, and Margaret Barker (Children's Hospital at Stanford, Palo Alto, Calif.) *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 129-142 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

A modification of a row/column scanning system was investigated in order to increase the speed and accuracy with which communication aids can be accessed with one or two switches. A selection algorithm was developed and programmed in BASIC to automatically select individuals with the characteristic difficulty in controlling time dependent control and display systems. Four systems were compared: (1) row/column directed scan (2 switches); (2) row/column auto scan (1 switch); (3) row auto scan (1 switch); and (4) column auto scan (1 switch). For this sample population, there were no significant differences among systems for scan time to select the correct target. The row/column auto scan system resulted in significantly more errors than any of the other three systems. Thus, the most widely prescribed system for severely physically disabled individuals turns out for this group to have a higher error rate and no faster communication rate than three other systems that have been considered inappropriate for this group. M.G.

N85-14550*# Systems Technology, Inc., Hawthorne, Calif.
A MANUAL CONTROL TEST FOR THE DETECTION AND DETERRENCE OF IMPAIRED DRIVERS
Anthony C. Stein, R. Wade Allen, and Henry R. Jex *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 143-156 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

A brief manual control test and a decision strategy were developed, laboratory tested, and field validated which provide a means for detecting human operator impairment from alcohol or other drugs. The test requires the operator to stabilize progressively unstable controlled element dynamics. Control theory and experi-

mental data verify that the human operator's control ability on this task is constrained by basic cybernetic characteristics, and that task performance is reliably affected by impairment effects on these characteristics. Assessment of human operator control ability is determined by a statistically based decision strategy. The operator is allowed several chances to exceed a preset pass criterion. Procedures are described for setting the pass criterion based on individual ability and a desired unimpaired failure rate. These procedures were field tested with apparatus installed in automobiles that were designed to discourage drunk drivers from operating their vehicles. This test program demonstrated that the control task and detection strategy could be applied in a practical setting to screen human operators for impairment in their basic cybernetic skills. R.J.F.

N85-14551*# Rush Medical Coll., Chicago, Ill. Dept. of Physiology.

ELECTROMYOGRAPHIC PATTERNS ASSOCIATED WITH DISCRETE LIMB MOVEMENTS

D. M. Corcos, G. L. Gottlieb, and G. C. Agarwal *In* NASA. Ames Research Center 20th Ann Conf. on Manual Control, Vol. 2 Sep. 1984 p 157-174 refs (For primary document see N85-14535 05-54)

(Grants NIH-NS-15630; NIH-AM-33189; NSF IESE-82-12067)

Avail: NTIS HC A18/MF A01

The relationship between the movement time (MT) for accurate and rapid discrete movements of distance A to a target of width W was quantified by Fitts and is given by the equation: MT = a + b log sub 2 (2A/W). This relationship, known as Fitt's Law, received considerable support for many types of movements. It also raises the interesting question: if MT is affected by distance moved and accuracy, then how do the patterns of muscle activation alter? It is suggested that it is unlikely that all movements are initiated by a pulse of constant duration. Instead, it seems that movements are initiated by an agonist burst which is scaled both in the amount of activation and the duration of activation according to either distance, target size, velocity, or a combination of factors. The number of bursts varies considerably and further research is required to establish: (1) which factors affect the pattern of the signal and (2) how different patterns produce movement trajectories. R.J.F.

N85-14552*# Forschungsinstitut fuer Anthropotechnik, Wachtberg (West Germany).

COLOR AND GREY SCALE IN SONAR DISPLAYS

K.-F. Kraiss and K.-H. Kuettelwesch *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 175-180 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

In spite of numerous publications [1] it is still rather unclear, whether color is of any help in sonar displays. The work presented here deals with a particular type of sonar data, i.e., LOFAR-grams (low frequency analysing and recording) where acoustic sensor data are continuously written as a time-frequency plot. The question to be answered quantitatively is, whether color coding does improve target detection when compared with a grey scale code. The data show significant differences in receiver-operating characteristics performance for the selected codes. In addition it turned out, that the background noise level affects the performance dramatically for some color codes, while others remain stable or even improve. Generally valid rules are presented on how to generate useful color scales for this particular application. R.J.F.

N85-14553*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MANUAL-CONTROL ANALYSIS APPLIED TO THE MONEY-SUPPLY CONTROL TASK

R. C. Wingrove *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 181-198 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

The recent procedure implemented by the Federal Reserve Board to control the money supply is formulated in the form of a tracking model as used in the study of manual-control tasks. Using this model, an analysis is made to determine the effect of monetary control on the fluctuations in economic output. The results indicate that monetary control can reduce the amplitude of fluctuations at frequencies near the region of historic business cycles. However, with significant time lags in the control loop, monetary control tends to increase the amplitude of the fluctuations at the higher frequencies. How the investigator or student can use the tools developed in the field of manual-control analysis to study the nature of economic fluctuations and to examine different strategies for stabilization is examined. R.J.F.

N85-14554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WHAT PILOTS LIKE (AND DON'T LIKE) ABOUT THE NEW COCKPIT TECHNOLOGY

Renwick E. Curry (Search Technology, Inc., Palo Alto, Calif.) *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 199-216 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

Pilot's perceptions of the new cockpit technology in the B-767 are discussed. Although the data reported were taken from the introductory experience of the B-767, it is felt that similar, if not identical, results would be obtained with any other new cockpit technology aircraft, i.e., the A310. The following conclusions were drawn from the information collected thus far: A large majority of the pilots enjoy flying the B-767 more than the older airplanes. The pilots accept the new cockpit technology, and they choose to use it because they find it useful. The pilots are aware of the possible loss of flying skill with the presence of automation, and they hand fly (usually with flight director) to prevent this loss. There is no evidence of loss of skills from the data collected. The primary points of confusion or surprise were autothrottle/autopilot interactions; the autopilot during the wrong way or not capturing the course; and achieving desired results with the Flight Management System/Control Display Unit (FMS/CDU). The pilots felt training for the FMS/CDU could be improved, and they especially wanted more hands on experience. R.J.F.

N85-14555*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CREW COMMUNICATION AS A FACTOR IN AVIATION ACCIDENTS

Joseph Goguen (Structural Semantics, Palo Alto, Calif.), Charlotte Linde (Structural Semantics, Palo Alto, Calif.), and Miles Murphy *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 217-248 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A03/MF A01 CSCL 05H

The incidence of air transport accidents caused by problems in crew communication and coordination was investigated. Communication patterns which are most effective in specific situations were determined. Methods to assess the effectiveness of crew communication patterns were developed. The results lead to the development of new methods training crews in effective communication and provide guidelines for the design of aviation procedures and equipment. E.A.K.

N85-14556*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A FULL MISSION SIMULATOR STUDY OF AIRCREW PERFORMANCES: THE MEASUREMENT OF CREW COORDINATION AND DECISIONMAKING FACTORS AND THEIR RELATIONSHIPS TO FLIGHT TASK PERFORMANCES

Miles R. Murphy, Robert J. Randle, Trieve A. Tanner, Richard M. Frankel (Wayne State Univ., Detroit, Mich.), Joseph A. Goguen (Structural Semantics, Palo Alto, Calif.), and Charlotte Linde (Structural Semantics, Palo Alto, Calif.) *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 249-262 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

Sixteen three man crews flew a full mission scenario in an airline flight simulator. A high level of verbal interaction during instances of critical decision making was located. Each crew flew

the scenario only once, without prior knowledge of the scenario problem. Following a simulator run and in accord with formal instructions, each of the three crew members independently viewed and commented on a videotape of their performance. Two check pilot observers rated pilot performance across all crews and, following each run, also commented on the video tape of the crew's performance. A linguistic analysis of voice transcript is made to provide assessment of crew coordination and decision making qualities. Measures of crew coordination and decision making factors are correlated with flight task performance measures. E.A.K.

N85-14557*# Stanford Univ., Calif.
COMMUNICATION ON THE FLIGHT DECK
A. Siesfeld, R. Curley, and R. Calfee *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 263-272 (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

The importance of good verbal communication by airplane crews is discussed. The common understanding of what it takes to fly a plane serves the communication and coordination. It is shown that accidents and incidents often are a result of failure to communicate. People's conceptions of what they are doing effect performance of a task and communication about performance of that task. It is known that if what they are doing is complex, they must find a simple framework to represent it to avoid being overwhelmed by complexity. A model that reduces the complexity of flying a jet to a representation composed of a few relatively independent dimensions which capture the major features of this task was developed. The model allows assessment of what crew members know, to look at actual performance, and to develop training recommendations. E.A.K.

N85-14558*# Army Aviation Center, Fort Rucker, Ala.
DETERMINING TRAINING DEVICE REQUIREMENTS IN ARMY AVIATION SYSTEMS
Michael L. Poumade *In* NASA. Ames Research Center 20th Ann. Conf., on Manual Control, Vol. 2 Sep. 1984 p 273-282 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

A decision making methodology which applies the systems approach to the training problem is discussed. Training is viewed as a total system instead of a collection of individual devices and unrelated techniques. The core of the methodology is the use of optimization techniques such as the transportation algorithm and multiobjective goal programming with training task and training device specific data. The role of computers, especially automated data bases and computer simulation models, in the development of training programs is also discussed. The approach can provide significant training enhancement and cost savings over the more traditional, intuitive form of training development and device requirements process. While given from an aviation perspective, the methodology is equally applicable to other training development efforts. E.A.K.

N85-14559*# Illinois Univ., Urbana. Cognitive Psychophysiology Lab.
THE DESIGN AND USE OF SUBTASKS IN PART TRAINING AND THEIR RELATIONSHIP TO THE WHOLE TASK
Amir M. Mane, Michael G. H. Coles, Demetrios Karis, David Strayer, and Emanuel Donchin *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 283-290 refs (For primary document see N85-14535 05-54)
Avail: NTIS HC A18/MF A01 CSCL 05H

The part versus whole training is discussed. Common sense dictates that a massive body of knowledge should not be taught as a whole. For the same reason, if a part of the task is very difficult, one should not go over the task in its entirety. Repetitive training on the difficult part should lead to better results. Several part training methods were developed, including: pure part, progressive part, repetitive part, retrogressive and isolated parts. The question was posited whether training on parts of a task is a beneficial enterprise. The way the task will be disassembled for the part training needs to be determined. It is argued that the effectiveness of part training depends on the degree to which a task is decomposable. E.A.K.

N85-14560*# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
REPRESENTING MULTIDIMENSIONAL SYSTEMS USING VISUAL DISPLAYS
Elizabeth J. Casey, Arthur F. Kramer, and Christopher D. Wickens *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 291-298 refs (For primary document see N85-14535 05-54)
(Contract MDA903-83-K-0255)
Avail: NTIS HC A18/MF A01 CSCL 05H

Techniques employed to represent multiattribute information in an integrated, object display are reviewed and discussed. A study is proposed to investigate the effects of system parameters such as intervariable correlation on the choice of an optimal display format. The results of a psychophysical scaling study of five different displays are presented. Author

N85-14561*# California State Univ., Hayward.
TYPES OF TRACKING ERRORS INDUCED BY CONCURRENT SECONDARY MANUAL TASK
Stuart T. Klapp, Patricia A. Kelly, Vernol Battiste, and Sherry Dunbar *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 299-304 refs (For primary document see N85-14535 05-54)
(Contract NCC2-223)
Avail: NTIS HC A18/MF A01 CSCL 05H

Future one-man helicopters may require the pilot to control flight with one hand, and simultaneously manipulate other instruments using the other hand. The nature of errors induced in a right hand tracking task (simulating flight control) when responses are required by the left hand are examined. The present experiment focused on detection of hesitations in which the tracking joy stick remained motionless for 1/3 sec. or longer. Author

N85-14562*# Illinois Univ., Urbana-Champaign. Dept. of Psychology.
THE EFFECTS OF TASK STRUCTURE ON TIME-SHARING EFFICIENCY AND RESOURCE ALLOCATION OPTIMALITY
Pamela S. Tsang and Christopher D. Wickens *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 305-318 refs (For primary document see N85-14535 05-54)
(Contract N00014-79-C-0658)
Avail: NTIS HC A18/MF A01 CSCL 05H

A distinction was made between two aspects of time sharing performance: time sharing efficiency and attention allocation optimality. A secondary task technique was employed to evaluate the effects of the task structures of the component time shared tasks on both aspects of the time sharing performance. Five pairs of dual tasks differing in their structural configurations were investigated. The primary task was a visual/manual tracking task which requires spatial processing. The secondary task was either another tracking task or a verbal memory task with one of four different input/output configurations. Congruent to a common finding, time-sharing efficiency was observed to decrease with an increasing overlap of resources utilized by the time shared tasks. Research also tends to support the hypothesis that resource allocation is more optimal when the time shared tasks placed heavy demands on common processing resources than when they utilized separate resources. Author

N85-14563*# Connecticut Univ., Storrs. Dept. of Electrical engineering and Computer Science.
ON CHOOSING BETWEEN TWO PROBABILISTIC CHOICE SUB-MODELS IN A DYNAMIC MULTITASK ENVIRONMENT
Eric P. Soulsby *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 319-336 refs (For primary document see N85-14535 05-54)
(Contract F33615-81-K-0510)

Avail: NTIS HC A18/MF A01 CSCL 05H

An independent random utility model based on Thurstone's Theory of Comparative Judgment and a constant utility model based on Luce's Choice Axiom are reviewed in detail. Predictions from the two models are shown to be equivalent under certain restrictions on the distribution of the underlying random process. Each model is applied as a stochastic choice submodel in a dynamic, multitask, environment. Resulting choice probabilities are nearly identical, indicating that, despite their conceptual differences, neither model may be preferred over the other based solely on its predictive capability. Author

N85-14564*# California Univ., Berkeley. Dept. of Electrical Engineering.

NO FATIGUE EFFECT ON BLINK RATE

Wonsoo Kim, Wolfgang Zangemeister (Hamburg Univ., West Germany), and Lawrence Stark *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 337-348 refs (For primary document see N85-14535 05-54)

(Contract NCC2-86)
Avail: NTIS HC A18/MF A01 CSCL 05H

Blink rate is reported to vary dependent upon ongoing task performance, perceptual, attentional and cognitive factors, and fatigue. Five levels of task difficulty were operationally defined and task performance as lines read aloud per minute were measured. A single noninvasive infrared TV eyetracker was modified to measure blinking and an on-line computer program identified and counted blinks while the subject performed the tasks. Blink rate decreased by 50% when either task performance increased (fast reading) or visual difficulty increased (blurred text); blink rate increased greatly during rest breaks. There was no change in blink rate during one hour experiments even though subjects complained of severe fatigue. Author

N85-14565*# Performance Measurement Associates, Inc., Vienna, Va.

PERFORMANCE MEASURES FOR AIRCRAFT LANDINGS AS A FUNCTION OF AIRCRAFT DYNAMICS

Edward M. Connelly *In* NASA. Ames Research Center 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 349-358 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

A theory of performance measurement for operator controlled systems is presented. The theory permits synthesis of a system performance measure which scores performance on successive data samples based on the impact of the sampled performance on the overall summary of performance. The development of measures for aircraft carrier landings for the glide path and angle of attack control channels is documented. While developing the performance measures, the measures used previously were evaluated and were found to lack the necessary discrimination capability. The previously used measure, the RMS of deviations from the glide path, can, for instance, provide identical scores for both satisfactory and unsatisfactory flight paths. Two types of performance measures developed for aircraft landings are described. Also, an argument is given for the need to test performance measures prior to their use. A suggested test of the measures is offered. B.G.

N85-14566*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MEASURING PILOT WORKLOAD IN A MOVING-BASE SIMULATOR. PART 2: BUILDING LEVELS OF WORKLOAD

Barry H. Kantowitz (BITS, Inc., West Lafayette, Ind.), Sandra G. Hart, Michael R. Bortolussi (BITS, Inc., West Lafayette, Ind.), Robert J. Shively (Purdue Univ., West Lafayette, Inc.), and Susan C. Kantowitz (BITS, Inc., West Lafayette, Ind.) *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 373-396 refs (For primary document see N85-14535 05-54)

(Contract NCC2-228)
Avail: NTIS HC A18/MF A01 CSCL 05H

Pilot behavior in flight simulators often use a secondary task as an index of workload. His routine to regard flying as the primary task and some less complex task as the secondary task. While this assumption is quite reasonable for most secondary tasks used to study mental workload in aircraft, the treatment of flying a simulator through some carefully crafted flight scenario as a unitary task is less justified. The present research acknowledges that total mental workload depends upon the specific nature of the sub-tasks that a pilot must complete as a first approximation, flight tasks were divided into three levels of complexity. The simplest level (called the Base Level) requires elementary maneuvers that do not utilize all the degrees of freedom of which an aircraft, or a moving-base simulator; is capable. The second level (called the Paired Level) requires the pilot to simultaneously execute two Base Level tasks. The third level (called the Complex Level) imposes three simultaneous constraints upon the pilot. B.G.

N85-14567*# National Aerospace Lab., Amsterdam (Netherlands).

MULTI-CREW MODEL ANALYTIC ASSESSMENT OF LANDING PERFORMANCE AND DECISION-MAKING DEMANDS

Paul Milgram, Rob vanderwijngaart, Henk Veerbeek, and Okko F. Bleeker (National Aerospace Lab., Schipol, Netherlands) *In* NASA. Ames Research Lab. 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 373-396 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

Some of the relative merits of the PROCRU approach to modelling multi-crew flight deck activity during approach to landing are discussed. On the basis of two realistic flight scenarios, the ability of the model to simulate different vectored approaches is demonstrated. A secondary exemplary analysis of a nominal and an accelerated final approach is performed, illustrating the potential of the expected net gain (ENGP) functions as a measure of decision-making load. Author

N85-14568*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE STERNBERG TASK AS A WORKLOAD METRIC IN FLIGHT HANDLING QUALITIES RESEARCH

John C. Hemingway *In its* 20th Ann. Conf. on Manual Control, Vol. 2 Sep. 1984 p 397-422 refs (For primary document see N85-14535 05-54)

Avail: NTIS HC A18/MF A01 CSCL 05H

The objective of this research was to determine whether the Sternberg item-recognition task, employed as a secondary task measure of spare mental capacity for flight handling qualities (FHQ) simulation research, could help to differentiate between different flight-control conditions. FHQ evaluations were conducted on the Vertical Motion Simulator at Ames Research Center to investigate different primary flight-control configurations, and selected stability and control augmentation levels for helicopers engaged in low-level flight regimes. The Sternberg task was superimposed upon the primary flight-control task in a balanced experimental design. The results of parametric statistical analysis of Sternberg secondary task data failed to support the continued use of this task as a measure of pilot workload. In addition to the secondary task, subjects provided Cooper-Harper pilot ratings (CHPR) and responded to a workload questionnaire. The CHPR data also failed to provide reliable statistical discrimination between FHQ treatment conditions; some insight into the behavior of the secondary task was gained from the workload questionnaire data. Author

N85-14569# Los Alamos Scientific Lab., N. Mex.

ACCEPTANCE-TESTING PROCEDURES FOR AIR-LINE SUPPLIED-AIR SUITS

O. D. Bradley Jun. 1984 24 p refs

(Contract W-7405-eng-36)
(DE84-016980; LA-10156-MS) Avail: NTIS HC A02/MF A01

Procedures and requirements were established for airline supplied air suits for testing and evaluation. The adequacy of performance, recommendations for improvement and/or operational restrictions of the devices are made. The test equipment, test methods, design, and performance criteria for airline supplied air suits are prescribed. DOE

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N85-14570 Stanford Univ., Calif.
MEMORY HIERARCHIES FOR DIRECTLY EXECUTED LANGUAGE MICROPROCESSORS Ph.D. Thesis
Donald Bruce Alpert 1984 153 p
Avail: Univ. Microfilms Order No. DA8420483

Directly Executed Language (DEL) architectures are a class of computer architectures that directly represent the operators and objects of high-level programming languages using the contour model for storage assignment. DELs have previously been shown to exhibit significant reductions in static code size, number of instructions executed, and memory traffic in comparison with traditional computer architectures. Trends in semiconductor processing technology indicate that DEL architectures are more appropriate than traditional architectures for single-chip microprocessor designs. More specifically, DEL architectures better exploit both the large amounts of memory integrated in microprocessors and the limited bandwidth available for microprocessors to access external memory. This dissertation reports the results of research studies concerning data storage requirements for DELs and cache performance tradeoffs, thus contributing to memory hierarchy design for both DEL and other microprocessors. Dissert. Abstr.

N85-14571*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
IMPROVING THE SPACELAB MASS MEMORY UNIT TAPE LAYOUT WITH A SIMULATION MODEL
Steven R. Noneman Dec. 1984 136 p refs
(NASA-TM-86483; NAS 1.15:86483) Avail: NTIS HC A07/MF A01 CSCL 09B

A tape drive called the Mass Memory Unit (MMU) stores software used by Spacelab computers. MMU tape motion must be minimized during typical flight operations to avoid a loss of scientific data. A projection of the tape motion is needed for evaluation of candidate tape layouts. A computer simulation of the scheduled and unscheduled MMU tape accesses is developed for this purpose. This simulation permits evaluations of candidate tape layouts by tracking and summarizing tape movements. The factors that affect tape travel are investigated and a heuristic is developed to find a good tape layout. An improved tape layout for Spacelab I is selected after the evaluation of fourteen candidates. The simulation model will provide the ability to determine MMU layouts that substantially decrease the tape travel on future Spacelab flights. Author

N85-14572*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics.
RESEARCH IN COMPUTER SCIENCE Semiannual Report
James M. Ortega Dec. 1984 7 p
(Grant NAG1-242)
(NASA-CR-174088; NAS 1.26:174088; UVA/528209/AM85/106) Avail: NTIS HC A02/MF A01 CSCL 09B

Several short summaries of the work performed during this reporting period are presented. Topics discussed in this document include: (1) resilient seeded errors via simple techniques; (2) knowledge representation for engineering design; (3) analysis of faults in a multiversion software experiment; (4) implementation of parallel programming environment; (5) symbolic execution of concurrent programs; (6) two computer graphics systems for visualization of pressure distribution and convective density particles; (7) design of a source code management system; (8) vectorizing incomplete conjugate gradient on the Cyber 203/205; (9) extensions of domain testing theory and; (10) performance analyzer for the pisces system. B.W.

N85-14573# Department of the Navy, Washington, D. C.
A DATA COLLECTION SYSTEM Patent Application
S. L. Stello, inventor (to Navy) Filed 9 Jul. 1984 9 p
(AD-D011266; US-Patent-Appl-SN-629284) Avail: NTIS HC A02/MF A01 CSCL 09/2

The principal object of the present invention is to configure a data collection system to be modular in design so that the data collection interfaces can be built independently such that the data collection system can be customized quickly as needed without disturbing the in place operating components. Author (GRA)

N85-14574# Department of Energy, Washington, D. C.
HARDWARE MULTIPLIER PROCESSOR Patent Application
Paul E. Pierce, inventor (to DOE) Filed 26 Apr. 1983 62 p
(DE84-006174; US-Patent-Appl-SN-488824) Avail: NTIS HC A04/MF A01

A hardware processor is disclosed which in the described embodiment is a memory mapped multiplier processor that can operate in parallel with a 16 bit microcomputer. The multiplier processor decodes the address bus to receive specific instructions so that in one access it can write and automatically perform single or double precision multiplication involving a number written to it with or without addition or subtraction with a previously stored number. It can also, on a single read command automatically round and scale a previously stored number. The multiplier processor includes two concatenated 16 bit multiplier registers, two 16 bit concatenated 16 bit multipliers, and four 16 bit product registers connected to an internal 16 bit data bus. A high level address decoder determines when the multiplier processor is being addressed and first and second low level address decoders generate control signals. In addition, certain low order address lines are used to carry uncoded control signals. First and second control circuits coupled to the decoders generate further control signals and generate a plurality of clocking pulse trains in response to the decoded and address control signals. DOE

N85-14575# Hanford Engineering Development Lab., Richland, Wash.
EXPERIENCE WITH A SOPHISTICATED COMPUTER BASED AUTHORING SYSTEM
Patrick R. Gardner Apr. 1984 8 p Presented at the 25th Ann. ADCIS Conf., Columbus, Ohio, 14 May 1984
(Contract DE-AC06-76FF-02170)
(DE84-014644; HEDL-SA-3129-FP; CONF-840539-2) Avail: NTIS HC A02/MF A01

Two conclusions regarding Computer Based Authoring Systems (CBAS) were reached: (1) CBAS drastically reduces programming time and the need for expert programmers; and (2) CBAS appears to have minimal impact on initial lesson design. Both of these comments have significant impact on any Cost-Benefit analysis for Computer-Based Training. The first tends to improve cost-effectiveness but only toward the limits imposed by the second. Westinghouse Hanford Company (WHC) recently purchased a

sophisticated CBAS, the WISE/SMART system from Wicat (Orem, UT), for use in the Nuclear Power Industry. Experience with this system relative to Items (1) and (2) above are detailed; lesson design time will be compared with lesson input time. Also provided will be the WHC experience in the use of subject matter experts (though computer neophytes) for the design and inputting of CBT materials. DOE

N85-14576# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF THE NLTSS OPERATING SYSTEM
Pierre J. DuBois 1 Jun. 1984 19 p refs Presented at the Conf. on Operating Systems for Supercomputers, Princeton, N.J., 21-22 Jun. 1984
(Contract W-7405-eng-48)
(DE84-013702; UCRL-90923; CONF-8406171-1) Avail: NTIS HC A02/MF A01

An account of the development process for the network livermore time sharing system (NLTSS) is presented. The motivation factors, development tools, programming language, and services are addressed. The NLTSS was conceived as a network operating system with components capable of supporting a single worker computer while being completely capable of accessing services and resources independent of location. It is a set of server processes cooperating on a single host computer to produce the functionality needed to offer interactive computing, production computing, multiprogramming, security, and accountability. M.G.

N85-14577# California Univ., Livermore. Lawrence Livermore Lab.
REQUIREMENTS AND OVERVIEW OF THE LINCS DISTRIBUTED OPERATING SYSTEM ARCHITECTURE
Richard W. Watson Apr. 1984 11 p refs Presented at the 13th CRAY User Group Meeting, Paris, 25-27 Apr. 1984
(Contract W-7405-eng-48)
(DE84-01321; UCRL-8404177-1; CONF-8404177-1) Avail: NTIS HC A02/MF A01

An overview of the Livermore Interactive Network Communication System (LINCS) architecture is presented. LINCS is an integrated operating system and network architecture. To emphasize this integration LINCS is referred to as a network or distributed operating system architecture. A metaphor that may be useful in thinking about LINCS is that it provides a software bus structure that provides a framework for integrating new applications and services. The software bus is defined by a layered set of communication protocols. DOE

N85-14578# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
NORTHERN TELECOM, INC., IBM 3033 (COMPILATION), NTI-585/565 (EXECUTION), XCOBOL, RELEASE 4.1, VERSION H(01) (COBOL TECHNICAL REPORT)
8 May 1984 15 p
(PB84-228048; OIT/FSTC-84/223) Avail: NTIS HC A02/MF A01 CSCL 09B

The results obtained from the evaluation of the XCOBOL Release 4.1 Version H(01) compiler against the indexed I-O are summarized. All of the discrepencies found are reported. R.S.F.

N85-13818# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/CI/LS.
THE CDC: FACILITIES ON OFFER FROM THE CNES COMPUTING CENTER FOR SPACE MATHEMATICS (A LOOK AT THE CAPACITIES OF CDC COMPUTERS) [LE CDC: MOYENS OFFERTS PAR LE CENTRE INFORMATIQUE DU CNES AUX MATHEMATIQUES SPATIALES (APERCU DES POSSIBILITES DES ORDINATEURS C.D.D.)]
D. Galarreta *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 445-457 refs In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

N85-13819# Centre National d'Etudes Spatiales, Toulouse (France). Dept. DTI/CM/SM.
THE FACILITIES OF THE CALCULATION CENTER AND REAL TIME ROOM FOR SATELLITE POSITIONING [LES MOYENS DU CIMTT EN MISE A POSTE]
F. X. Boisserie *In its* Satellite Motion: Lectures and Exercises on Space Mech. 1984 p 459-465 In FRENCH (For primary document see N85-13807 05-13)
Avail: NTIS HC A99/MF A01

N85-13994*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROGRAMMABLE DIGITAL BAUD INTEGRATORS FOR THE RADAR HIGH-SPEED DATA ACQUISITION SYSTEM
K. H. Farazian and R. F. Jurgens *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 142-151 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-14579 Stanford Univ., Calif.
FAST ALGORITHMS AND SPECIALIZED ARCHITECTURES Ph.D. Thesis
Peng-Huat Ang 1984 130 p
Avail: Univ. Microfilms Order No. DA8420484

Very Large Scale Integration (VLSI) enables designers to implement entire systems on a single silicon chip. As a result, the issue is no longer what can be implemented–it is what will be implemented and how. A principal theme here is to explore the synergistic interplay between algorithms and architectures in signal processing tasks and to find appropriately matched chip architectures. A secondary objective is to identify core signal processing primitives in such applications. The research focussed on two problems. The first is in speech analysis. The square-root normalized ladder algorithm is studied in detail. It is shown that its computational complexity is reduced by recasting the algorithm in terms of rotational primitives. The second problem is eigenvalue decomposition. Two approaches to this problem are considered. The first is a variant of the well-known QR algorithm. The second approach is based on the solution of a matrix differential equation. Dissert. Abstr.

N85-14580 Stanford Univ., Calif.
VECTOR QUANTIZATION OF DIGITAL IMAGES Ph.D. Thesis
Richard Louis Baker 1984 260 p
Avail: Univ. Microfilms Order No. DA8420486

Several black and white image coding structures using vector quantizers are examined. All use product codes which, though suboptimum, outperform optimum full search codes of equivalent complexity. Those tested operate on blocks of up to 7 x 7 pixels and rates from 0.3 to over 2.0 bits per pixel. All scalar quantize each source block's sample mean using a predictive coder and then encode the remaining vector valued residual in various ways using a VQ. It is shown that these structures yield images which attain and in some ways better the performance of a conventional adaptive discrete cosine transform coder of roughly comparable complexity. An architecture is presented which permits VQ encoding of low resolution images in real time using conventional hardware. Tricks useful for efficient design of good VQ codebooks are also included. Dissert. Abstr.

N85-14581 California Univ., Los Angeles.
CONCURRENCY IN PARALLEL PROCESSING SYSTEMS
Kenneth Ching-Yu Kung 1984 177 p
Avail: Univ. Microfilms Order No. DA8420200

A computer job was modeled as a Directed Acyclic Graph (DAG), each node in the DAG representing a separate task that can be processed by any processor. Four parameters are used to

characterize the concurrency problem which results in 16 cases. The four parameters are: (1) how the jobs arrive: either a fixed number of jobs at time zero or jobs arriving from a Poisson source; (2) the DAG: either the same for each job or each job randomly selecting its DAG; (3) service time of each task; constant or exponentially distributed; (4) the number of processors; either a fixed number or an infinite number. A common concurrency measure was defined which gives a comparison of how much parallelism can be achieved. The concurrency measure is obtained exactly for several cases by first converting the DAG into Markov chain where each state represents a possible set of tasks that can be executed in parallel. Two algorithms for assigning the tasks to processors was presented. One algorithm minimizes the expected time to complete all jobs while the other algorithm maximizes the utilization of the processors. Dissert. Abstr.

N85-14582 California Univ., Los Angeles.
INTEGRATED RESOURCE MANAGEMENT ALGORITHMS FOR COMPUTER SYSTEMS Ph.D. Thesis
John Richard Busch 1984 282 p
Avail: Univ. Microfilms Order No. DA8420156

The integration of computer resource management algorithms was studied in order to realize significant system level price/performance improvements from current trends in component technologies. The research proceeded by building a bread-board kernel and performance measurement and analysis tools for a current computer family, characterizing the workload and system behavior, implementing popular algorithms and observing their interactions, developing and analyzing improved functional partitions and algorithms, examining applicability of the principles and algorithms to decentralized system configurations, and establishing the follow-on research into algorithm integration for decentralized systems. Major results in algorithm integration include: a simple method of expressing performance objectives through external tuning and to have them reflected in local resource management decisions, and disc access scheduling based on a prioritization which integrate the fetching posting requirements of transient and permanent objects based on current system urgency.
Dissert. Abstr.

N85-14583 Carnegie-Mellon Univ., Pittsburgh, Pa.
CONTROL OF WALKING: LOCAL CONTROL AND REAL TIME SYSTEMS Ph.D. Thesis
Marc Daniel Donner 1984 179 p
Avail: Univ. Microfilms Order No. DA8418322

This thesis describes the results of research conducted with the objective of designing and constructing control programs for a six legged walking machine. This research makes two intimately interconnected contributions. The first is a decomposition of the walking task that exhibits a great deal of locality of control, relies on almost no global information, and requires little computation. The second is a programming language, OWL, specially designed to provide the real time performance and concurrency control needed to implement the walking program. The language made the walking strategy much easier to develop, and the strategy provided a guide for the design of the language. The important feature of the decomposition of the walking task is the assignment of a separate, independent, and asynchronous process to control each leg. There are two important features of the programming language. One is the observation that in concurrent asynchronous programming, loops are more important than blocks. The other is the preemption mechanism, called alert, that permits one process among a group to preemptively terminate its concurrent sibling processes. Dissert. Abstr.

N85-14584 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A PROPOSAL FOR STANDARD BASIC FUNCTIONS IN Ada
J. Kok (Centrum voor Wiskunde en Informatica, Amsterdam) and G. T. Symm Jun. 1984 12 p refs
(NPL-DITC-45/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

A standard basic mathematical functions package for scientific computation in Ada is proposed. The package is transportable to machines with different floating-point types and its availability enhances the portability of numerical software. Author (ESA)

N85-14585# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
S-MICRO: A SYSTEM FOR SIMULATING A MICROPROGRAMMED CONTROL UNIT [S-MICRO - SISTEMA PARA SIMULACAO DE UNIDADE DE CONTROLE MICROPROGRAMADA]
Ronaldo Luiz Dias Cereda and Jose Carlos Maldonado Aug. 1984 7 p refs In PORTUGUESE; ENGLISH summary Presented at the 5th Congr. Brasileiro de Automatica/1st Congr. Latino-Am. de Automatica
(INPE-3224-PRE/575) Avail: NTIS HC A02/MF A01

A system for development of microprogrammed digital systems is proposed, whose main design goal is to permit the whole simulation of the microprogrammed control unit. This way an effort is made to facilitate the integrated development of the control unit architecture, of the microprogram and even of the microprogrammed system under test. The system is introduced in detail both from the hardware and the software point of view. Its advantages over other existing propositions are also introduced, emphasizing its differences and a number of limitations. Author

N85-14586# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
HOW TO IMPLEMENT THE WELCOME PROGRAM IN COMPATIBLE MICROCOMPUTERS SUCH AS APPLE 2 [COMO IMPLEMENTAR O PROGRAMA DE BOAS VINDAS EM MICROCOMPUTADORES COMPATIVEIS COM O APPLE 2]
Ricardo Varela Correa May 1984 10 p In PORTUGUESE; ENGLISH summary Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico (FNDCT) Submitted for publication
(INPE-3114-PRE/511) Avail: NTIS HC A02/MF A01

A program controlling the diskette directory by identifying each program with an assigned letter is described. It recognizes the type of program (archival or assembly), and selects and runs every program of the directory according to the asigned letter. Certain subroutines and memory of APPLESOFT are used i.e., CALL-868, CALL-198, PEEK (-16384), and CALL-936. Memory positions are used to identify each character written on the screen. The screen is divided into three segments, each represented by decimal ranges; e.g., 1024-1063 corresponds to the first line of the screen of the first section. Each third of the screen has eight lines and four columns. Letters between the positions 1027 and 1029 are used to identify the programs that are included in the directory. A step-by-step analysis of the welcome program is provided. Transl. by B.G.

N85-14587# Argonne National Lab., Ill. Mathematics and Computer Science Div.
USE OF MONITORS IN FORTRAN: A TUTORIAL ON THE BARRIER, SELF-SCHEDULING DO-LOOP AND ASK FOR MONITORS
E. L. Lusk and R. A. Overbeek Jul. 1984 44 p refs
(Contract W-31-109-eng-38)
(DE84-016506; ANL-84-51) Avail: NTIS HC A03/MF A01

A set of macro libraries has been developed that allows progammers to write portable FORTRAN code for multiprocessors. This document presents, in tutorial form, the macros used to implement three common synchronization patterns: self scheduling DO loops, barrier synchronization, and the ask for monitor. DOE

N85-14588# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Mathematische Verfahren und Datentechnik.
MAXIMUM LIKELIHOOD ESTIMATION OF PARAMETERS IN LINEAR SYSTEMS FROM FLIGHT TEST DATA: A FORTRAN PROGRAM
Ermin Plaetschke Jan. 1984 94 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-896)

(AD-B087198L; DFVLR-Mitt-84-10) Avail: NTIS HC A05/MF A01

A program for maximum likelihood estimation of flight mechanical parameters in linear systems was developed. The mathematical background, a list of input data, flow charts of the main program, the maximum likelihood subroutine using an output error method, the FORTRAN source of the main program, and listings of the subroutines are given. The program is demonstrated using the lateral and longitudinal movement of a De Havilland DH C-2 Beaver aircraft. Author (ESA)

N85-14589# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany).

INCREASE IN THE ECONOMY OF DESIGN AND PROCESS PLANNING BY INTEGRATED AND GRAPHIC DATA PROCESSING, PHASE 2 Final Report, Oct. 1983

Rolf Feddersen, Ulrich Grupe, and Juergen Nagel (Dornier-Werke GmbH, Friedrichshafen, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 143 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-84-028; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 30

Software modules and interface programs were elaborated to rationalize the development and production of aircraft. Design, preliminary construction, detailed construction, weight and solidity calculations, production planning, and numerical control of production are covered. As basic system for the graphical-interactive dialogs and the internal representations of objects the Lockheed CADAM system was used. Author (ESA)

N85-14590# Oxford Univ. (England). Dept. of Engineering Science.

EFFICIENT SORTING ROUTINES IN FORTRAN 77

G. T. Houlsby and S. W. Sloan 1984 21 p refs

(OUEL-1529/84) Avail: NTIS HC A02/MF A01

Algorithms for sorting the entries in a list into ascending sequence of their values, based on FORTRAN 77 implementations of the insertion sort, quicksort and modified quicksort algorithms, are given. The first algorithm is suitable for short lists, while the second two are suitable for longer lists. The removal of recursion from the quicksort algorithm by the use of stacks is described. All the implementations are believed to be efficient, and should prove useful in engineering applications. Timing statistics are given to illustrate the utility of the subroutines presented. Author (ESA)

N85-14591# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.

EXPERIMENTAL TECHNIQUES OF FORMAL SPECIFICATIONS FOR THE DESIGN OF TESTED AND RELIABLE COMPUTER PROGRAMS Ph.D. Thesis [EXPERIMENTATION DE TECHNIQUES DE SPECIFICATION FORMELLE POUR LA CONCEPTION DE LOGICIELS FIABLES ET PROUVES]

Gregorio DeUgarte May 1984 350 p refs In FRENCH

(ENST-84E007; ISSN-0751-1353) Avail: NTIS HC A15/MF A01

A method to produce the best possible specification for each level of completeness of computer system knowledge is discussed. The theory of abstract algebraic types is examined in the analyses of the formal specification concept. A specification implemented by three components is proposed: an informal specification, a formal specification initially incomplete which contains all the known abstract properties of the system, and a formal description of an abstract implementation of the system. The resultant redundancy allows for coherence verifications. The technique is applied to an example. The results show the feasibility and the advantages of this approach. Author (ESA)

N85-14592# Ecole Nationale Superieure des Telecommunications, Paris (France).

AUTOMATIC DETERMINATION OF MOTION IN AN IMAGE SEQUENCE. THE INTEREST FOR INTERPRETATION Ph.D. Thesis [DETERMINATION AUTOMATIQUE DU MOUVEMENT DANS UNE SEQUENCE D'IMAGE INTERET POUR L'INTERPRETATION]

Yann Leguilloux 29 Jun. 1984 184 p refs In FRENCH

(ENST-84E012; ISSN-0751-1353) Avail: NTIS HC A09/MF A01

An algorithm to correlate the images of a sequence, based on dynamic programming, is presented. The prepared algorithm shows displacements in images without using arbitrary information. The algorithm is applied to detect and follow moving vehicles in image sequences. The results are visualized for interpretation. Author (ESA)

N85-14593# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.

TOWARDS A SPECIFICATION OF THE B PROGRAMMING ENVIRONMENT

J. A. M. vandeGraaf May 1984 27 p refs

(CWI-CS-R8408; B8471276) Avail: NTIS HC A03/MF A01

A B language programming environment that assures ease of use for beginning and nonspecialist users, without the need to consult a manual, is outlined. System variables are divided into documents, i.e., objects which can be visualized on the screen and which have a name in the system; and abstract objects, i.e., virtual notions needed to define the state of the system, but which do not exist for the user. Displaying and editing are not separate functions. The screen is divided into windows, each displaying part of a document. There are no special process handling commands. The user can type several commands and the system decides if they are run simultaneously. It is not clear whether searching is a system function, edit function, or combination. A trace mode indicates where the next execution step is. Author (ESA)

62 COMPUTER SYSTEMS

Includes computer networks.

N85-14594 National Physical Lab., Teddington (England). Protocol Standards Group.

IMPLEMENTATION ASSESSMENT OF A NETWORK SERVICE. THE TEST RESPONDER EXERCISER SPECIFICATION

P. Oliver Jun. 1984 19 p refs Sponsored by UK Department of Trade and Industry's Electronics and Avionics Requirements Board and the EEC

(NPL-DITC-44/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

The functional capability of procedures to test a client's implementation of the Test Responder of the global network service on a stand-alone basis is defined. Operation of a checkout exerciser and an interactive exerciser is described. Author (ESA)

N85-14595# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.

CONTRIBUTION TO THE STUDY AND REALIZATION OF THE CARTHAGE MULTISERVICE LOCAL NETWORK Ph.D. Thesis [CONTRIBUTION A L'ETUDE ET LA REALISATION DU RESEAU LOCAL MULTISERVICES CARTHAGE]

Mohand Tahar Takhedmit 20 Mar. 1984 275 p refs In FRENCH

(ENST-84E006; ISSN-0751-1353) Avail: NTIS HC A12/MF A01

High bit rate transmission in distributed packet switching local computer networks was studied in order to show that elaborated decision procedures controlling high transmission rates are feasible. The CARTHAGE is a hybrid communication network using optical fibers and time multiplexing at 8 Mbps. A first solution based on automata using matrices of programmable array logic type, field programmable logic array and field programmable logic sequencer may support rates larger than 8 Mbps. A second solution is based on the development of a specific integrated circuit and supports a rate of 32 Mbps. The realization of full custom integrated circuits for specific applications is also discussed. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N85-14596 University of Southwestern Louisiana, Lafayette.
KNOWLEDGE-BASED COMMUNICATION AND MANAGEMENT SUPPORT IN A SYSTEM DEVELOPMENT ENVIRONMENT
Beverly I. Kedzierski 1983 228 p
Avail: Univ. Microfilms Order No. DA8416778

The identification of project management and communication support as an important domain of an effective software development environment, and the application of speech act theory to that domain is considered. A framework, or paradigm, was designed for such an environment using a knowledge based, program synthesis approach from artificial intelligence. A pilot communication and management support environment (CMS) was implemented. Studies of system/user interaction helped form the theory that people, while interacting with a computer system, perform communication or management acts, such as questioning, informing, requesting, critiquing, or planning. An act taxonomy was created and the structure and relationships among some of these acts were formally represented. A representation of time as hierarchical periods was also created. Protocols were developed for project activity and formally represented as rules that refer to the project model and acts. Dissert. Abstr.

N85-14597 Stanford Univ., Calif.
USE OF ARTIFICIAL INTELLIGENCE AND SIMPLE MATHEMATICS TO ANALYZE A PHYSIOLOGICAL MODEL
John C. Kunz 1984 180 p
Avail: Univ. Microfilms Order No. DA8420576

The objective of this research is to demonstrate a methodology for design and use of a physiologic model in a computer program that suggests medical decisions. The model is used to analyze physiological behavior, identify the effects of abnormalities, identify appropriate therapies, and predict the results of therapy. A vocabulary for representing a physiological model is proposed. Analysis and explanation of physiological function is based ultimately on causal relations. Inference rules are proposed for making valid qualitative causal arguments with both kinds of causal basis. A knowledge base in the field of renal physiology has been built. A computer program analyzes this knowledge base and demonstrates the methodology. Results of this reseach suggest that there is more power for problem solving in a methodology exploiting both domain-specific heuristics and basic principles than there is in methodologies emphasizing one of these kinds of knowledge to the exclusion of the other. Dissert. Abstr.

N85-14598 Rochester Univ., N. Y.
APPLICATIONS OF CONNECTIONIST MODELING TECHNIQUES TO SIMULATIONS OF MOTOR CONTROL SYSTEMS Ph.D. Thesis
Sanjaya Addanki 1984 215 p
Avail: Univ. Microfilms Order No. DA8416577

The use of connectionist modeling, a highly parallel, distributed computational framework, to model the fine structure of animal motor control systems was investigated. A model of a part of the oculomotor (OM) system of the primate was built. The purpose of the exercise is to see if the connectionist model of the OM system is useful to those wishing to understand the fine structure of the OM system. The connectionist model is successful in that, it closely approximates animal behavior in a wide variety of situations. The model makes specific predictions about the fine structure of the OM system. For example, the model shows how neurons might be interconnected to produce the extended time constant behavior of the vestibuloocular reflex (VOR) and the optokinetic (OKS) subsystems of the OM system. The model also shows how neurons might be connected to generate the correct interactions between the VOR and pursuit subsystems of the OM system. The study of the OM system leads to the concept of channel structured control systems in which several identical control systems act in parallel, each computing a small part of the total dynamic range to effect the final behavior. Dissert. Abstr.

N85-14599# Stuttgart Univ. (West Germany). Inst. fuer Produktionstechnik und Automatisierung.
PROGRAMMING AND APPLICATION OF NUMERICAL CONTROLLED MEASURING MACHINES (NCMES) Final Report, Mar. 1982
Siegfried Pauly, Rainer Ohnheiser, Heinrich Schoeling (Technische Hochschule, Aachen), Peter Stoeck (Technische Hochschule, Aachen), Heinz-Reiner Wollersheim (Technische Hochschule, Aachen), Dirk Gerlach (EXAPT-Verein), Heinz Joseph Hesper (Rheinmetall GmbH), and Hans-Joachim Neumann (Zeiss (Carl)) Bonn Bundesministerium fuer Forschung und Technologie Jul. 1984 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-153; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21.50

The Numerical Controlled Measuring Evaluation System (NCMES) was developed for automatic programming of measuring procedures. Part programs are generated by formulating the measuring tasks in a language similar to EXAPT. The control data for the measuring machine and evaluation programs are generated in a central computer containing the NCMES software, written in FORTRAN. The output is processed by the control system connected to the measuring machine. The NCMES can be integrated into CAD/CAM systems. Author (ESA)

N85-14600# Oxford Univ. (England). Dept. of Engineering Science.
AN H-INFINITY-MINIMAX APPROACH TO THE DESIGN OF ROBUST CONTROL SYSTEMS
Yung Kuan Foo and Ian Postlethwaite Jul. 1984 19 p refs Revised
(OUEL-1537/84) Avail: NTIS HC A02/MF A01

The H-infinity minimax approach to feedback design was applied to perturbed sensitivity matrix studies of robust stability. A robust design problem based on a weighted combination of the sensitivity and complementary sensitivity matrices was posed. A solution to the problem, together with a conceptual algorithm, are obtained by minimizing the sensitivity function alone. Author (ESA)

N85-14601# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
ONE QUEUE OR TWO PUSHDOWN STORES TAKE SQUARE TIME ON A ONE-HEAD TAPE UNIT
P. M. B. Vitanyi Mar. 1984 9 p refs Submitted for publication
(CWI-CS-R8406; B8471274) Avail: NTIS HC A02/MF A01

Simulation of one virtual queue or two virtual pushdown stores by one-head tape units is shown to take at least square time. Simulation means the implementation of the virtual queue or two pushdown stores on a one-head tape unit. Each multitape Turing machine can be simulated by a one-head tape unit in square time. A one-head tape as a synonym for a Turing machine with one single-head storage tape is used. A lower bound which matches this upper bound on simulation time, provides that in an oblivious Turing machine the movement of the storage tape heads is independent of the input and is a function of time alone. Kolmogorov's complexity method is used. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-14602 Technische Univ., Munich (West Germany). Inst. fuer Mathematik.
NUMERICAL TREATMENT OF CORNER SINGULARITIES OF THE BIHARMONIC EQUATION [NUMERISCHE BEHANDLUNG VON ECKENSINGULARITAETEN DER BIHARMONISCHEN GLEICHUNG]

L. Zink Sep. 1983 108 p refs In GERMAN
(TUM-M8315) Copyright. Avail: Issuing Activity

To reduce the discretization error in angular corners, difference schemes for the treatment of the plate equation were modified. Using polar coordinates, Kondratev's solution for the plate equation is discussed. Global convergence is proved for a simple difference scheme and the numerical error is estimated. If the error expansion of the numerical solution is known, modifications of the differences can be given near the origin, which allows disturbing error terms to be cancelled. Author (ESA)

N85-14603 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
ON AN ALGORITHM FOR PYTHAGOREAN SUMS AND ITS CONNECTION WITH CONTINUED FRACTIONS
G. T. Anthony May 1984 9 p refs
(NPL-DITC-42/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

A derivation of the Moler-Morrison algorithm for Pythagorean sums, which indicates explicitly its cubic convergence is given. A connection with the convergents of the continued fraction expansion of the square roots of certain integers is demonstrated. Author (ESA)

N85-14604 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
BOUNDARY ELEMENT METHODS IN POTENTIAL THEORY: FOUR LECTURES
G. T. Symm Jul. 1984 44 p refs Lect. held in Udine, Italy, Sep. 1983
(NPL-DITC-46/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

Integral equation formulations for Laplace's equation in two dimensions; applications of the simple layer logarithmic potential; applications of Green's boundary formula; and boundary element methods for three-dimensional and axisymmetric boundary value problems of the Dirichlet type are introduced. For individual titles, see N85-14605 through N85-14608.

N85-14605 National Physical Lab., Teddington (England).
INTEGRAL EQUATION FORMULATIONS IN TWO DIMENSIONS
G. T. Symm *In its* Boundary Element Methods in Potential Theory Jul. 1984 p 1-11 refs (For primary document see N85-14604 05-64)
Copyright. Avail: Issuing Activity

Formulations of the Dirichlet and Neumann problems for Laplace's equation in two dimensions are introduced in terms of integral equations. Methods based on the simple and double-layer potential formulations are known as indirect methods, since the source densities, obtained by solving the integral equations, do not necessarily have any physical significance. Methods based on Green's third identity are called direct methods, since the source densities in this formula are the required function and its normal derivative, both of which are likely to have immediate significance, as, for example, in heat conduction problems, where they represent temperature and heat flux respectively. Author (ESA)

N85-14606 National Physical Lab., Teddington (England).
APPLICATIONS OF THE SIMPLE-LAYER LOGARITHMIC POTENTIAL
G. T. Symm *In its* Boundary Element Methods in Potential Theory Jul. 1984 p 11-20 refs (For primary document see N85-14604 05-64)
Copyright. Avail: Issuing Activity

The simplest form of indirect boundary element methods for the solution of Laplace's equation, based upon the simple-layer logarithmic potential representation with a piecewise constant approximation to the source density is introduced. The method is applied to a Dirichlet problem which arises in connection with the general technique of conformal mapping and involves computation of conjugate harmonic functions. A Neumann problem arising in fluid flow and involving computation of derivatives of the simple-layer logarithmic potential is also treated. Techniques for discretizing the integral equations which arise, and thereby solving the problems numerically, are discussed. Author (ESA)

N85-14607 National Physical Lab., Teddington (England).
APPLICATIONS OF GREEN'S BOUNDARY FORMULA
G. T. Symm *In its* Boundary Element Methods in Potential Theory Jul. 1984 p 21-30 refs (For primary document see N85-14604 05-64)
Copyright. Avail: Issuing Activity

The direct boundary element method based upon Green's boundary formula for the solution of Laplace's equation in two dimensions is introduced. Only the simplest numerical implementation of the method is described, but more accurate numeral results may be obtained from the same formulation by using more accurate representations than piecewise constant approximations. By introducing shape functions as used in finite element methods, a hierarchy of boundary element methods based upon the integral equation formulation can be derived. It is shown how the method can be adapted to account for boundary singularities, and domains comprising more than one material, in heat conduction problems. Author (ESA)

N85-14608 National Physical Lab., Teddington (England).
THREE-DIMENSIONAL AND AXISYMMETRIC PROBLEMS
G. T. Symm *In its* Boundary Element Methods in Potential Theory Jul. 1984 p 31-40 refs (For primary document see N85-14604 05-64)
Copyright. Avail: Issuing Activity

Boundary element methods for three-dimensional and axisymmetric boundary value problems of the Dirichlet type are introduced for the Laplace equation. The Newtonian potential, which corresponds to the simple-layer logarithmic potential in two dimensions, is outlined, and its application to the Dirichlet problem is discussed. Numerical implementations of this formulation are described for problems in which domain and boundary conditions have rotational symmetry. Results of calculations of electrostatic capacitance are presented. Author (ESA)

N85-14609# Sandia Labs., Albuquerque, N. Mex.
MOST WANTED FACTORIZATIONS USING THE QUADRATIC SIEVE
J. A. Davis and D. B. Holdridge Aug. 1984 23 p refs
(Contract DE-AC04-76DP-00789)
(DE84-016208; SAND-84-1658) Avail: NTIS HC A02/MF A01

The study of the crypto-security of the RSA algorithm at Sandia National Laboratories has focused attention on factorization of large integers, as no attack of lesser computational complexity has thus far surfaced. Recent experience in the development of a state-of-the-art factorization capability is described. The various changes in the algorithm that have enabled factorization of 70-digit numbers in times comparable to those for 50 digits a year ago are described in some detail. DOE

N85-14610# European Space Agency, Paris (France).
MATHEMATICAL MODELS FOR THE BRIGHTNESS TEMPERATURE OF OBJECT AND ENVIRONMENT IN THE MICROWAVE REGION
Juergen Preissner and Volker Stein May 1984 55 p refs Transl. into ENGLISH of "Math. Modelle zur Ermittlung der Strahlungstemp. von Objekt u. Umgebung im Mikrowellenber", DFVLR, Oberpfaffenhofen, West Germany Rept. DFVLR-FB-83-12, 1983
(ESA-TT-829; DFVLR-FB-83-12) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 17,10

Remotely sensed objects and ground were modelled by flat surfaces by the panel method. The radiation of sky, ground and atmosphere as well as the pattern of the sensor antenna are described by mathematical models. A computer program for calculating the brightness temperature of object and environment is described. The computations are carried out for a simply structured object on a lossy ground. The brightness temperature is presented as a function of the sensor position for the frequencies 11, 32, 90, and 140 GHz. Author (ESA)

N85-14611# European Space Agency, Paris (France).
LINEAR ASSOCIATIVE MAPPING
Klaus Arbter Jul. 1984 23 p refs Transl. into ENGLISH of "Lineare assoziative Abbildungen", DFVLR, Oberpfaffenhofen, West Germany Rept. DFVLR-FB-84-01, 1984 Original report in GERMAN previously announced as N84-25375
(ESA-TT-856; DFVLR-FB-84-01) Avail: NTIS HC A02/MF A01; original German version available from DFVLR, Cologne DM 11,50

It is recalled that for discrete signal vectors, linear mappings exist which have comparable characteristics. Memory and time saving implementations of this concept are derived on the basis of a geometric interpretation. The application of linear associative mapping to image processing is discussed. A problem in image processing is that patterns of the same shape but appearing at a different place in the image are treated as different patterns. A certain tolerance with respect to small positional changes exists if the autocorrelation function of the pattern is flat in the vicinity of the zero point. If greater positional changes are to be considered, the same pattern can be input in different positions. However, this means that the storage and computing effort increases proportionally with the number of learning steps, with proportionally decreasing immunity from perturbations. Author (ESA)

N85-14612# Freiburg Univ. (West Germany). Inst. fuer Angewandte Mathematik.
INTERVAL INTERATION METHODS FOR NONLINEAR EQUATION SYSTEMS: THEORY AND COMPARISON ON COMPUTER Thesis [INTERVALL-ITERATIONSVERFAHREN FUER NICHTLINEARE GLEICHUNGSSYSTEME: THEORIE UND PRAKTISCHER VERGLEICH AM COMPUTER]
Guntram Schrempp Jan. 1984 105 p refs In GERMAN
(Intervall-Ber-84/6) Avail: NTIS HC A06/MF A01

Interval arithmetic methods are used to find a solution of the standard problem f(x) = 0 in the multidimensional case. To determine the convergence of the interval iterative methods the expansivity of Newton operators is studied. Programs for 11 Newton-iterative methods are applied to 13 test functions. Author (ESA)

N85-14613# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
COUPLING OF MULTIDIRECTIONAL DIFFUSIONS BY REFLECTION
Torgny Indvall and L. C. G. Rogers 1984 28 p refs Submitted for publication
(CTH-Math-1984-20; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Special cases of diffusions in multidimensional real spaces were constructed in order to study the reflection method of coupling. Conditions for coupling are found for coupling of Brownian motions, coupling of solutions of certain stochastic differential equations, and the radial drift case. Author (ESA)

N85-14614# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
SOME ERROR ESTIMATES FOR THE p-VERSION OF THE FINITE ELEMENT METHOD
Kenneth Eriksson 1984 17 p refs Submitted for publication
(CTH-Math-1984-21; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

The p-version of the finite element method was applied to a one dimensional model problem. Precise asymptotic error estimates are obtained in the energy norm, the L2-norm and the maximum norm. It is also shown that the p-method is nonoptimal in the L2-norm. The proofs use spectral analysis. Only quasi-uniform partitions were considered and a similarity (in singularity) to a Dirichlet type corner problem is indicated. Author (ESA)

N85-14615# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A LUMPED MASS FINITE ELEMENT METHOD WITH QUADRATURE FOR A NONLINEAR PARABOLIC PROBLEM
Yi-Yong Nie and Vidar Thomee 1984 43 p refs Submitted for publication
(CTH-Math-1984-22; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

The semidiscrete and totally discrete variants of the lumped mass method with quadrature were analyzed for a nonlinear second order parabolic equation in a two dimensional real space, using piecewise linear approximating functions. The forward Euler and the linearized Crank-Nicolson schemes were considered. Error estimates are shown to be of optimal order in L-sub-2 and of almost optimal order in L-sub-infinity. Positivity and monotonicity properties of the discrete solution operator are also obtained. Author (ESA)

N85-14616# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
LOEB SOLUTIONS OF THE BOLTZMANN EQUATION WITH INITIAL BOUNDARY VALUES AND EXTERNAL FORCES
Tony Elmroth 1984 33 p refs Submitted for publication
(CTH-Math-1984-23; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Space-inhomogeneous Boltzmann equations with external forces were studied using collision operators, streaming operators and reflection type boundary conditions. A group of linear operators on L sup 1 was defined. Solutions to the Loeb-space version of the mild Boltzmann equations are found. Techniques from nonstandard analysis prove that these solutions conserve mass and have bounded energy and H-functions. Author (ESA)

N85-14617# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A COMMENT ON ROSEN'S COMMENTS ON ACTIVATION AND INHIBITION
Johan Karlsson 1984 11 p refs Submitted for publication
(CTH-Math-1984-24; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

Connections between differential forms and Rosen's activation-inhibition pattern were studied. A simultaneous integrating factor was defined. Necessary and sufficient conditions for a collection of one-forms to admit this factor are found. A sparse cohomology sequence is suggested together with an operator on forms. Author (ESA)

N85-14618# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
RELAXATION TIMES FOR QUEUEING SYSTEMS
J. P. C. Blanc and E. A. vanDoorn May 1984 24 p refs Submitted for publication
(CWI-OS-R8407; B8471286) Avail: NTIS HC A02/MF A01

Relaxation time is proposed to characterize the speed with which system performance measures tend to their steady state values. Relaxation times for queueing models are surveyed. Author (ESA)

N85-14619# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ON THE EDGEWORTH EXPANSION FOR THE SUM OF A FUNCTION OF UNIFORM SPACINGS
R. J. M. M. Does (Limburg University, Netherlands), R. Helmers, and C. A. J. Klaassen (Leiden University) Apr. 1984 19 p refs Submitted for publication
(CWI-MS-R8404; B8471289) Avail: NTIS HC A02/MF A01

An Edgeworth expansion for the sum of a fixed function g of normed uniform spacings under a natural moment assumption and a Cramer type condition is established. This condition is shown to hold under an easily verifiable, mild condition on the function g. Author (ESA)

N85-14620# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ON THE WEAK LIMITS OF ELEMENTARY SYMMETRIC POLYNOMIALS

A. J. vanEs May 1984 20 p refs Submitted for publication
(CWI-MS-R8407; B8471294) Avail: NTIS HC A02/MF A01

Results on the weak limits of elementary symmetric polynomials in the case where the order of the polynomials is proportional to the number of variables are extended. Author (ESA)

N85-14621# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
PRIORITY REWRITE SYSTEMS
J. C. M. Baeten (Technische Hogeschool, Delft), J. A. Bergstra, and J. W. Klop May 1984 55 p refs Submitted for publication
(CWI-CS-R8407; B8471275) Avail: NTIS HC A04/MF A01

First principles of term rewrite systems (TRS) including signatures, term algebras, congruences and rewrite sets are introduced. The conventional notion of a TRS is extended to that of a priority rewrite system (PRS). In a PRS different rules may have relative priorities. The semantics of the PRS mechanism are discussed. The use of the PRS mechanism in stacks, queues and Backus functional programming is shown. Author (ESA)

N85-14622# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
PROCESS ALGEBRA FOR COMMUNICATION AND MUTUAL EXCITATION
J. A. Bergstra and J. W. Klop May 1984 37 p refs Revised Submitted for publication
(CWI-CS-R8409; CWI-IW-218/83; B8471277) Avail: NTIS HC A03/MF A01

Algebraic theory of processes is discussed. An algebra of communicating processes (ACP) of process cooperation is considered. Free merge or interleaving; merging with communication; merging with mutual exclusion of critical sections; and synchronous process cooperation are studied. Relationships to hold between the four concepts of merging are shown. The ACP is based on elementary operations and the operators: alternative composition or choice; sequential composition or product; and parallel composition or merge. A constant for deadlock or failure and the operators left merge, communication merge and encapsulation are introduced. Left merge operator simplifies computation and has metamathematical consequences. Milder's method designed in Calculus of Communicating Systems (CCS) and synchronous CCS are related with ACP systems but the silent steps obtained by abstractional form internal steps are not considered. Author (ESA)

N85-14623# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
STEP-BY-STEP STABILITY IN THE NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS
J. G. Verwer and K. Dekker Sep. 1983 29 p refs
(CWI-NW-161/83; B8471284) Avail: NTIS HC A03/MF A01

Numerical methods for evolutionary problems in Partial Differential Equations (PDE) which show a direct relation to integration methods for stiff Ordinary Differential Equations (ODE), are considered. Numerical stability in time-integration, is discussed. Close connections between stiff problems and PDE with respect to nonlinear stability are illustrated. An application which results from the nonlinear stability in analysis is given. Nonlinear stability analysis of approximations for the two-space dimensional (shallow water equation) is examined. The method of lines approach clearly shows a direct relation between PDE and stiff ODE. Author (ESA)

N85-14624# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
MIXED DEFECT CORRECTION (ITERATION) FOR THE SOLUTION OF A SINGULAR PERTURBATION PROBLEM
P. W. Hemker Dec. 1983 34 p refs Submitted for publication
(MC-NW-162/83; B8471283) Avail: NTIS HC A03/MF A01

A discretization method (mixed defect correction) for the solution of a two dimensional elliptic singular perturbation problem is described. This method is an iterative process in which two basic discretization schemes (with and without artificial diffusion) are used. The resulting method is stable and yields a second order accurate approximation in the smooth parts of the solution, without a hypothesis of special directional bias in the discretization. This method can be applied in problems with interior or boundary layers. Author (ESA)

N85-14625# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
LINEAR AUTONOMOUS RETARDED FUNCTIONAL DIFFERENTIAL EQUATIONS; A SHARP VERSION OF HENRY'S THEOREM
S. M. Verduyn Lunel Mar. 1984 48 p refs
(CWI-AM-R8405; B8471262) Avail: NTIS HC A03/MF A01

Retarded functional differential equations (RFDE) on reflexive state spaces are considered. Diekmann's method is used. Properties of Volterra convolution integral equation make it possible to extend the RFDE on nonreflexive state spaces to RFDE on larger reflexive state space. A sharp version of Henry's theorem is proved. Author (ESA)

N85-14626# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
SOME IMPLEMENTATIONS OF MULTIGRID LINEAR SYSTEM SOLVERS
P. W. Hemker and P. M. deZeeuw Jan. 1984 38 p refs Submitted for publication
(CWI-NM-R8401; B8471282) Avail: NTIS HC A03/MF A01

Implementation of multigrid methods for general elliptic seven point difference equations in a machine independent programming language is discussed. Two FORTRAN codes to provide the user with a program (ILU- or ILLU-relaxation) that efficiently solves a large clas of difference equations, are described. Scalar and vector versions are compared. Multigrid algorithms are used. A general multigrid algorithm is described in ALGOL 68.
Author (ESA)

N85-14627# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
CONVERGENCE OF METHOD OF LINES APPROXIMATIONS TO PARTIAL DIFFERENTIAL EQUATIONS
J. G. Verwer and J. M. Sanz-Serna (Valladolid University, Spain) May 1984 18 p refs Submitted for publication
(CWI-NM-R8404; B8471279) Avail: NTIS HC A02/MF A01

Convergence of one step method of lines schemes for numerical solutions of evolutionary problems in partial differential equations is considered. A general framework for a convergence analysis is applied to nonlinear problems. Stability conditions are taken from nonlinear stiff ordinary differential equations. Logarithmic matrix norm and C-stability are related. Nonlinear parabolic equations and the cubic Schroedinger equations are solved.
Author (ESA)

N85-14628# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
CONSERVATIVE AND NONCONSERVATIVE SCHEMES FOR THE SOLUTION OF THE NONLINEAR SCHROEDINGER EQUATION
J. M. Sanz-Serna (Valladolid University, Spain) and J. G. Verwer May 1984 28 p refs Submitted for publication Sponsored by Comision Asesora
(CWI-NM-R8405; B8471278) Avail: NTIS HC A03/MF A01

Schema for the integration in time of a space discretization of the nonlinear Schroedinger equation are studied. Five methods (implicit point, pseudo linear midpoint, scheme of Griffiths, and two splitting procedures) for the time integration of the resulting system of ordinary differential equations are discussed. The partly explicit scheme of Griffiths and splitting procedures are found to perform poorly. Drawbacks and advantages of using time integrators which exactly conserve energy are discussed. Author (ESA)

N85-13991*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A VERY EFFICIENT TRANSFER FUNCTION BOUNDING TECHNIQUE ON BIT ERROR RATE FOR VITERBI DECODED, RATE

1/N CONVOLUTIONAL CODES
P. J. Lee *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 114-123 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 12A

N85-13992*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEQUENTIAL SYNDROME DECODING OF CONVOLUTIONAL CODES
I. S. Reed and T. K. Truong *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 124-135 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 12A

N85-13993*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VLSI ARCHITECTURES FOR THE MULTIPLICATION OF INTEGERS MODULO A FERMAT NUMBER
J. J. Chang, T. K. Truong, I. S. Reed, and I. S. Hsu *In its* The Telecommunications and Data Acquisition Rept. 15 Nov. 1984 p 136-141 refs (For primary document see N85-13980 05-32)
Avail: NTIS HC A09/MF A01 CSCL 12A

N85-14663# Joint Publications Research Service, Arlington, Va.
MOLARITY PRINCIPLE: FOUNDATION FOR PARALLEL DIGITAL SIGNAL PROCESSES Abstract Only
V. M. Amerbayev and I. T. Pak *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 93 Transl. into ENGLISH from Izv. Akad. Nauk Kaz. SSR, Ser. Fiz.-Mat. (Alma-Ata, USSR), May - Jun. 1983, no. 3 p 7-10 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-14629 Polytechnic Inst. of New York, Brooklyn.
SOME TECHNIQUES IN IMAGE PROCESSING Ph.D. Thesis
Bouzid Aliane 1984 119 p
Avail: Univ. Microfilms Order No. DA8420439

The theory and applications of some statistical techniques in image processing are presented. A smoothing iterative algorithm is introduced to improve the quality of a noisy picture. The scheme is based on a 3 x 3 mask with variable weighting coefficients, resulting in a smoothing process which suppresses the noise within the region without blurring its boundary. A restoration scheme is also presented which leads to the reconstruction of an image for which correct data is available in localized regions. The algorithm restores completely the image after an infinite number of iteractions. A direct application of the Robbins-Monro stochastic approximation to estimating the coefficients of an orthogonal expansion representation of images is also considered. In the past part, a comparative study of robustized recursive estimators based on three philosophical approaches (light limiter, nonlinear preprocess and m-interval partition approximation) is presented. Dissert. Abstr.

N85-14630# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
CONSTRUCTION OF A CONFIDENCE REGION FOR LINEAR FUNCTIONS WITH UNKNOWN PARAMETERS
A. G. Gadziev (Academy of Sciences (USSR), Baku) 1984 14 p refs Submitted for publication
(CTH-Math-1984-17; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

A linear model with arbitrary distributions of errors and unknown but bounded variance of error was studied. At every point, only one observation was made. Same variance estimators were defined and their properties considered. A consistent, asymptotically unbiased estimation of unknown parameters and a construction of a confidence region for linear functions are obtained. Author (ESA)

N85-14631# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
THE GROWTH AND COMPOSITION OF SUPERCRITICAL BRANCHING POPULATIONS ON GENERAL TYPE SPACES
Olle Nerman 1984 55 p refs Submitted for publication
(CTH-Math-1984-18; ISSN-0347-2809) Avail: NTIS HC A04/MF A01

The composition and growth of supercritical general type Grump-Mode-Jagers branching populations were analyzed using asymptotical theory for Markov renewal sequences, applying a twist and discount transformation. The analysis also utilized the counting of population by random characteristics depending on daughter processes. The principal results are: formulating the usual asymptotical exponential growth behavior of means; establishing the coming generation as a nonnegative continuous time martingale; L-2 convergence of the martingale by second moment restrictions; L-1 convergence of the exponentially normed characteristic counted population; convergence in probability of the empirical composition; conditions for the composition asymptotics on the set of nonextinction; and generalizations of many stable pedigree ideas. Author (ESA)

N85-14632# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
AN ON-LINE PARAMETER ESTIMATION ALGORITHM FOR COUNTING PROCESS OBSERVATIONS
P. J. C. Spreij May 1984 10 p refs Submitted for publication
(CWI-OS-R8406; B8471285) Avail: NTIS HC A02/MF A01

The parameter estimation problem for counting process (CP) observation is considered. The intensity of CP is adapted to the family of Sigma algebras autogenerated by the counting process. The intensity is assumed to depend linearly on deterministic constant parameters. Heuristic derivation for an on-line parameter estimation algorithm is given. Author (ESA)

N85-14633# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ESTIMATING A MONOTONE DENSITY
P. Groenenboom Apr. 1984 18 p refs Submitted for publication
(CWI-MS-R8403; B8471288) Avail: NTIS HC A02/MF A01

Local and global results on estimating a monotone density are discussed. The fact that a centered version of the L1-distance between a smooth strictly decreasing density and its maximum likelihood estimator is asymptotically normal, is proved. This distance has an asymptotic variance which is independent of the density. The results are derived from the structure of a jump process generated by Brownian motion. Author (ESA)

N85-14634# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
APPROXIMATING THE PERCENTAGE POINTS OF GREENWOOD'S STATISTIC WITH CORNISH-FISHER EXPANSIONS
R. J. M. M. Does, R. Helmers, and C. A. J. Klaassen (Leiden Univ.) Apr. 1984 10 p refs Submitted for publication
(CWI-MS-R8405; B8471290) Avail: NTIS HC A02/MF A01

Cornish-Fisher expansion (CFE) is suggested to approximate the percentage points for the Greenwood Statistic (GS). Monte Carlo results show that CFE of the upper percentage points of GS work quite well for not too small sample sizes. Author (ESA)

N85-14635# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
A MONOTONICITY PROPERTY OF THE POWER FUNCTION OF MULTIVARIATE TESTS
P. Groeneboom and D. R. Truax (Oregon Univ.) Apr. 1984 15 p refs Submitted for publication
(CWI-MS-R8406; B8471295) Avail: NTIS HC A02/MF A01

A monotonicity property of the power function of multivariate tests is discussed. Partial results of Perlman-Olkin's conjecture are proved. Author (ESA)

N85-14636# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
A LIMIT THEOREM FOR THE SUPERPOSITION OF RENEWAL PROCESSES
H. C. P. Berbee May 1984 9 p refs
(CWI-MS-R8408; B8471293) Avail: NTIS HC A02/MF A01

The asymptotes of a superposition of renewal point processes is studied from the point the view of Palm theory. A counter example is given. Author (ESA)

N85-14637# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ASYMPTOTIC DISTRIBUTIONS OF ESTIMATORS FOR POSTERIOR PROBABILITIES IN A CLASSIFICATION MODEL WITH BOTH CONTINUOUS AND DISCRETE VARIABLES
A. W. Ambergen May 1984 30 p refs
(CWI-MS-R8409; B8471292) Avail: NTIS HC A03/MF A01

Asymptotic distribution of estimators for the posterior probability that an observation vector originates from one of k populations, is studied. The estimators are based on training samples. Random vectors with continuous and discrete variables are considered. Observation vector and prior probabilities are regarded as constants. The continuous part of the random vector is assumed to have conditional distribution and the discrete part is assumed to have multivariate normal distribution. Homogenity of the dispersion matrices is discussed. Author (ESA)

N85-14638# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
A NOTE ON TWO PAPERS IN DEPENDENT CENTRAL LIMIT THEORY
R. D. Gill May 1984 13 p refs Submitted for publication
(CWI-MS-R8410; B8471291) Avail: NTIS HC A02/MF A01

Helland's and Kurtz' methods on the dependent central limit theorem (martingale approach and Poisson process approach) are compared. Applications to statistical problems in survival analysis, life-testing, demography, and epidemiology are discussed. Author (ESA)

N85-14639# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
HOLLINGS HUNGRY MANTID MODEL FOR THE INVERTEBRATE FUNCTIONAL RESPONSE CONSIDERED AS A MARKOV PROCESS. PART 3: MATHEMATICAL ELABORATIONS
H. J. A. M. Heijmans Apr. 1984 47 p refs Submitted for publication
(CWI-AM-R8407-Pt-3; B8471264) Avail: NTIS HC A03/MF A01

An analytical model describing predatory behavior is studied. The parameter describing the predator's behavior is satiation. Semigroup methods and compactness arguments are used to show that a stable satiation distribution is reached if time tends to infinity. The transition to the much simpler problem obtained when the prey (prey biomass) density tends to zero is justified using Trotter-Kato's theorem. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-14640# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
THE TRANSIENT BEHAVIOR OF NETWORKS WITH INFINITE SERVER NODES
J. P. C. Blanc May 1984 21 p refs Submitted for publication
(CWI-OS-R8408; B8471287) Avail: NTIS HC A02/MF A01

The time needed by mean number of jobs in a Jackson network to reach its steady-state value within 1%, when the system starts working at time 0 with given numbers of jobs at the various nodes; and the relation of this time to the relaxation time of the mean number of jobs in the network are discussed for networks with infinitely many servers at each node. An upper bound is derived for the instants after which the mean number of jobs in a initially empty network with infinitely many servers at each node stays within a given percentage of its steady state value. This upper bound is asymptotically a linear function of the size of the network. From small networks there is evidence that the same upper bound applies to networks with arbitrary (finite) numbers of servers at the various nodes. The results are useful for deciding when a network may be considered to be in equilibrium. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-14641 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A ROUTINE TO FIND THE LOWEST FEW EIGENVALUES AND VECTORS FOR THE GENERALISED SPARSE SYMMETRIC EIGENPROBLEM
A. G. P. Warham May 1984 64 p refs
(NPL-DITC-43/84; ISSN-0262-5369) Copyright. Avail: Issuing Activity

A bidirectional coordinate relaxation method with block iteration was investigated as a means of computing the lowest few eigenvalues and eigenvectors of the generalized eigenvalue problem for sparse real symmetric matrices. The method does not require factorization of either of the matrices defining the problem. When used to determine the lowest few vibrational frequencies and modes of a pipework structure, the method computed correct solutions but is found to be an order of magnitude slower than methods in which the mass or stiffness matrix is factorized. In its present form, therefore, the method is suitable primarily for problems so large that matrix factorization is impracticable. Author (ESA)

N85-14642# California Univ., Berkeley. Lawrence Berkeley Lab.
LECTURES ON GENERALIZED SOLUTIONS TO THE MINIMAL SURFACE EQUATION
M. Miranda Jun. 1984 25 p refs Prepared in cooperation with Trento Univ.
(Contract DE-AC03-76SF-00098)
(DE84-016882; LBL-18022) Avail: NTIS HC A02/MF A01

Topics covered include singular minimal hypersurfaces, generalized solutions, minimal hypersurfaces, first applications of generalized solutions, Bernstein's theorem, and existence of non-linear solutions to the minimal surface equation in the whole space.DOE

N85-14643# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A MARTINGALE APPROACH TO SUPERCRITICAL (C-M-J) BRANCHING PROCESSES
Harry Cohn (Melbourne Univ.) 1984 23 p refs Submitted for publication
(CTH-Math-1984-25; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

Convergence properties of supercritical CMJ branching processes were studied using a martingale approach. Existence of a Malthusian parameter, finiteness of a first moment and a certain restriction on continuity were assumed. Sufficient conditions for convergence in probability and almost sure convergence of normed [Z sup phi sub t] are obtained, where phi denotes the general characteristic of a CMJ process. These results involve convergence in distribution and mild restrictions on phi. Author (ESA)

N85-14644# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
TRILINEAR ALTERNATING FORMS ON A VECTOR SPACE OF

DIMENSION 7
A. M. Cohen and A. G. Helminck Mar. 1984 25 p refs Submitted for publication
(CWI-PM-R8402; B8471270) Avail: NTIS HC A02/MF A01

The isotropic groups and all trilinear alternating forms for vector spaces over fields (algebraically closed and finite fields) of dimension almost 7 over fields of cohomological dimension almost 1 are determined. Two corollaries of the trilinear alternating form classification are given in case they are relevant to finite geometry and combinatorics. The Galois cohomology is introduced and an account is given of the classification over a field of cohomological dimension at most 1. Author (GRA)

N85-14645# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
INVARIANT MEASURES AND THE EQUICONTINUOUS STRUCTURE RELATION 1
J. deVries and J. C. S. P. vanderWoude Mar. 1984 16 p refs Submitted for publication
(CWI-PM-R8403; B8471268) Avail: NTIS HC A02/MF A01

Topics in topological dynamics are considered. The problem of when the regionally proximal relation of a minimal flow is an equivalence relation and when a minimal flow which has no nontrivial equicontinuous factors is weakly mixing is considered. MacMahon's theorem (invariant measures) on special cases is stated and proved. This problem extends eigenvalue theorems. Author (ESA)

N85-14646# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
INVARIANT MEASURES AND THE EQUICONTINUOUS STRUCTURE RELATION 2: THE RELATIVE CASE
J. deVries and J. C. S. P. vanderWoude May 1984 19 p refs Submitted for publication
(CWI-PM-R8404; B8471269) Avail: NTIS HC A02/MF A01

A problem from topological dynamics is presented. Concepts of flow, homomorphisms, and almost periodic factors of homomorphisms are studied. A class of homomorphisms of minimal flows for which a relative regionally proximal relation is an equivalence relation is discussed. Properties of nontrivial homomorphisms which have almost periodic factor (weakly mixing and relatively invarying measures) are proved. Author (ESA)

N85-14647# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ORTHOGONAL POLYNOMIALS AND A DIRICHLET PROBLEM RELATED TO THE HILBERT TRANSFORM
C. F. Dunkl (Virginia University, Charlottesville) Jun. 1984 35 p refs Submitted for publication
(Grant NSF MCS-83-01271)
(CWI-PM-R8406; B8471266) Avail: NTIS HC A03/MF A01

An operator closely related to the Hilbert transform on the circle is shown to be unitarily equivalent to a shift realized on the basis of Pollaczek polynomials, (a family of orthogonal polynomials with weight supported by all the real line). Dirichlet's problem for the disk is associated with harmonic functions with specified boundary values on the upper half circle and with specified constant (possibly complex) directional derivatives on the real diameter. Poisson's Kernel is found and is used to obtain continuous and p-integrable functions. Boundedness results are studied. Dirichlet's problem as a limiting case of boundary value problems for certain special functions from the Heisenberg groups is considered. Author (ESA)

N85-14648# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A STUDY OF THE RECURSION YN+1=YN+TAU YN SUP M
J. M. Sanz-Serna (Valladolid University, Spain) and J. G. Verwer Apr. 1984 10 p refs Submitted for publication
(CWI-NM-R8403; B8471280) Avail: NTIS HC A02/MF A01

A recursion related with the model discretization of a nonlinear Ordinary Differential Equation (ODE) or energy method in ODE and a time-dependent method for partial differential equations is studied. Sharp bounds for iterants of the error presented by Euler's method and asymptotic estimates are given. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-14649 Stanford Univ., Calif.
HIGH RESOLUTION PHOTOACOUSTIC AND PHOTOTHERMAL IMAGING Ph.D. Thesis
Clayton Covey Williams 1984 110 p
Avail: Univ. Microfilms Order No. DA8420640

High resolution photoacoustic and photothermal imaging advances are described. Photoacoustic and photothermal theories were extended to include the effects of the highly focused optical power sources necessary for high resolution imaging. Three high frequency techniques (1 GHz) were demonstrated and used to characterize the material properties of solids. The formalism behind photothermal characterization of solids is established under general focusing conditions. An analysis of the frequency dependence of the photothermal response demonstrates that very high frequencies may be employed without loss of sensitivity if highly focused optical beams are used. Photothermal signal can be used to directly measure the thermal conductivity of solids on a microscopic scale. The three dimensional thermoacoustic field equation is derived and discussed. This equation is used to obtain the one dimensional thermoacoustic wave equation. Dissert. Abstr.

N85-14650# Technische Univ., Munich (West Germany). Lehrstuhl A fuer Thermodynamik.
THE ISOCHORIC HEAT CAPACITY OF FLUID SUBSTANCES IN THE CRITICAL REGION. PRE-EXAMINATIONS FOR A SPACELAB EXPERIMENT Final Report, Oct. 1983
Rainer Lange and Johannes Straub Bonn Bundesministerium fuer Forschung und Technologie Aug. 1984 136 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-034; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 28,50

An experimental device for measuring the isochoric heat capacity (Cv) in the critical region of sulfur hexafluoride was developed. Measurements were made under temperature gradients lower than minus 1 million K/sec and very near to the critical temperature (0,01 K). A correction was necessary to cope with the influence of gravity, so that the experiment can be done in space. The results are discussed in terms of classical and nonclassical theory; the coefficients of the power law giving Cv seem in good agreement with those already determined by experiments on other substances. Author (ESA)

N85-14651# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS
18 Oct. 1984 120 p Transl. into ENGLISH from various Russian articles
(JPRS-UPM-84-007) Avail: NTIS HC A06

This U.S.S.R. report contains various studies in the areas of physics and mathematics. Reports are presented on the following topics: (1) laser excitation of coupled surface electromagnetic and acoustic waves and of static surface structures in solids; (2) amplification of ultrashort pulses in crystals; (3) artificial defocusing lens in ionosphere; (4) fluid dynamics; (5) recent advances in laser applications; (6) transformation of energy spread of laser pumping via phase conjugation; and (7) experimental investigation and analysis of ocillations of thin-walled spherical shell during pulse loading. For individual titles, see N85-14652 through N85-14663.

N85-14652# Joint Publications Research Service, Arlington, Va.
LASER EXCITATION OF COUPLED SURFACE ELECTROMAGNETIC AND ACOUSTIC WAVES AND OF STATIC STRUCTURES

IN SOLIDS Abstract Only c36
V. I. Yemelyanov and V. N. Seminogov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 5 refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), v. 86, no. 3, Mar. 1984 p 1026-1036 Original language document announced as A84-31011 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

The theory of stimulated excitation of surface acoustic waves through interaction of laser radiation and an absorbing solid body is extended to include formation of surface lattices, reversible and irreversible depending on whether or not the process occurs within the range of Hooke's law, with attendant excitation of surface electromagnetic waves over a space-time modulated surface relief. Generation of a surface temperature wave during interference of a surface electromagnetic wave and a pumping radiation wave is followed by excitation of coherent surface acoustic waves and formation of static lattices, the instability of surface acoustic waves being interpreted from the standpoint of such a mechanism. An evaluation of the dependent of the parameters of surface acoustic waves on the parameters of the pumping wave, in the approximation of negligible ponderomotive forces at the body surface and in the linear approximation with respect to the slowly varying amplitude of surface relief modulation, reveals that the behavior of stimulated surface acoustic waves is determined by the incidence angle and the polarization of the pumping wave. B.W.

N85-14653# Joint Publications Research Service, Arlington, Va.
COHERENT AMPLIFICATION OF ULTRASONIC PULSES IN ACTIVATED CRYSTALS Abstract Only c76
O. P. Varnavskiy, A. N. Kirkin, A. M. Leontovich, A. M. Malikov, A. M. Mozharovskiy, and Ye. D. Trifonov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 10-11 Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), v. 86, no. 4, Apr. 1984 p 1227-1239 Original language document announced as A84-35504 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

Coherent amplification of ultrashort pulses in Nd:Yag and ruby at approximately 100 K is analyzed in the semiclassical approximation for a nondegenerate two-level system. Pulses in the picosecond range are considered of duration shorter than the characteristic time of transverse relaxation in the medium. The corresponding Maxwell-Bloch equations for the electric field and the atom density matrix are solved in the approximation of unidirectional plane transverse waves and slowly varying amplitude. An evaluation in terms of the McCall-Hahn area theorem yields the pulseform evolution during propagation through an amplifying medium, in contrast to the behavior in an attenuating one. Calculations based on slow transverse relaxation and negligible volume losses reveal that, unlike in the case of noncoherent amplification, there appears a doublet structure in the emission spectrum and the field envelope oscillates with sign reversal at the trailing edge of the pulse. B.W.

N85-14654# Joint Publications Research Service, Arlington, Va.
ARTIFICIAL DEFOCUSING LENS IN IONOSPHERE Abstract Only c32
G. N. Boyko, V. V. Vaskov, S. F. Golyan, A. V. Gurevich, Ya. S. Dimant, V. A. Zyuzin, V. Yu. Kim, G. P. Komrakov, L. A. Lobachevskiy, V. V. Migulin et al *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 12 Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), v. 39, no. 11, 10 Jun. 1984 p 533-536 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

Strong defocusing of perturbing radio waves is detected, indicating the creation of an effective defocusing lens in the ionosphere. Modess in which there is not anomalous absorption are employed in order to isolate the defocusing effects unambiguously. The experimental setup incorporates a 300 MW SURG heating system with a narrow radiation pattern. The concentration perturbations are diagnosed in the vertical sounding mode at 8 frequencies by means of a Doppler system. The experimental results were obtained during May and July 1983 under daytime conditions. The amplitude and Doppler frequency shift behavior of the probe wave is analyzed, and the defocusing coefficient is computed as a function of the frequency of the probe wave and power of the heating wave. The artificial lens detected results in significant attenuation of radio waves passing through it. Author

N85-14655# Joint Publications Research Service, Arlington, Va.
FRICTION AND HEAT EXCHANGE IN LAMINAR AND TURBULENT BOUNDARY LAYERS WITH AXISYMMETRICAL BODIES EXPOSED TO HETEROGENEOUS SUPERSONIC FLOW Abstract Only c02
I. G. Yeremeytsev and N. N. Pilyugin *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 18 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 2, Mar. - Apr. 1984 p 65-72 Original language document announced as A84-35734 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

Generalized formulas are derived for heat flow and friction stresses of the laminar and turbulent flow modes in a boundary layer for uniform and nonuniform flow about a body. An axisymmetrical blunt body is placed in a supersonic flow field of heated gas. The quasiunidimensional problem of the flow of a chemically nonequilibrium nonviscous gas is solved numerically in the region between the supersonic source and the shock wave. The flow of a nonuniform stream of gas about a spherically blunted body is analyzed as an example. Approximate expressions are derived for the distribution of the local heat flow and friction stress along the spherical surface of the body. The principles established are easily detected experimentally by measuring the integral coefficients of heat exchange, friction resistance and wave drag for bodies placed in nonuniform gas flows. Author

N85-14656# Joint Publications Research Service, Arlington, Va.
PROPULSIVE EFFICIENCY OF VIBRATING WING IN SUPERSONIC FLOW Abstract Only c02
M. N. Kogan and M. V. Ustinov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 19 Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), no. 2, Mar. - Apr. 1984 p 132-139 Original language document announced as A84-35736 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

It is shown that the problem of determining the shape of a wing with minimum resistance for a given lifting force can be solved for a vibrating wing by expressing the working force and resistance through the circulation distribution along the wing, finding the optimum circulation distribution and its corresponding minimum resistance and then finding the wing shape (for subsonic velocities); for supersonic velocities the resistance and lifting force can be expressed for the potential on the traveling characteristic surface, and then the wing shape derived. The minimum power required to obtain given lifting force and thrust is determined, and the maximum power received by a wing from a flow for a given resistance is found. The solution is sought within the framework of the linear theory of supersonic flows. The resistance which must be overcome in order to obtain some power is always greater than the amount of thrust which can be obtained with the help of that power. Author

N85-14657# Joint Publications Research Service, Arlington, Va.
DESIGN OF SWIRLED AXISYMMETRIC TURBULENT JETS Abstract Only c34
Z. Sh. Zhumayev, A. A. Abramov, and R. A. Fayziyev *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 20 Transl. into ENGLISH from Izv. Akad. Nauk Uzb. SSR, Ser. Tekh. (Tashkent, USSR), no. 2, Mar. - Apr. 1984 p 51-54 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

The problem of swirling a jet for such applications as turbulization of the flame from burners in industrial furnaces or combustion chambers is treated on the basis of steady state turbulent straight axisymmetric flow of an incompressible fluid with the addition of a tangential velocity component. In the corresponding system of four partial differential equations there appears an exchange coefficient proportional to the mixing half width squared. After reduction to

dimensionless form, this system of nonlinear equations is solved for the appropriate boundary conditions with constant momentum flow and constant moment of momentum. Radial profiles of both axial and tangential velocity components at various distances from the nozzle throat have been calculated numerically by the method of finite differences with an implicit scheme. The maxima of both velocity components are found to decrease and to shift toward the jet axis with increasing distance from the nozzle. A sharp swirl can give rise to a positive pressure gradient sufficiently large to produce a backcurrent. The results agree qualitatively with experimental data. Author

N85-14658# Joint Publications Research Service, Arlington, Va.
PROCEDURAL ASPECTS OF TESTING AERODYNAMIC MODELS WITH COMBUSTION IN HIGH-ENTHALPY TRANSIENT-MODE INSTALLATIONS Abstract Only **c34**
V. K. Bayev, V. V. Shumskiy, and M. I. Yaroslavtsev *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 20 Transl. into ENGLISH from Izv. Sib. Otd. Akad. Nauk SSSR, Ser. Tekh. Nauk, no. 4, issue 1, Mar. 1984 p 68-77 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

Feed, wind-tunnel balance, pressure, and heat flow instrumentation systems are developed for short-term testing of various models with combustion for different relative positions of the nozzle, the models and the systems that support the models and instrumentation complex. The models are tested in an IT-301 pulsed wind tunnel with various media being input to the model. The models examined are a flat plat for studying spontaneous ignition of fuel media, or gasdynamic models for investigating the gas dynamics of suppling heat to the channel of the model. A feed system based on the electrohydraulic effect is developed. The methods used to study the force characteristics and pressure in the models are described. Author

N85-14659# Joint Publications Research Service, Arlington, Va.
NUMERICAL METHOD FOR COMPUTING SUPERSONIC FLOW OVER WINGS OF FLIGHT VEHICLES Abstract Only **c02**
G. P. Voskresenskiy *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 25 Transl. into ENGLISH from Zh. Vychisl. Mat. i Mat. Fiz. (Moscow), v. 24, no. 6, Jun. 1984 p 900-915 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

A numerical method is described for calculating the supersonic flow over wings with blunted and tapering profiles. The proposed algorithms are based on a numerical method for computing supersonic spatial flow over tapered bodies proposed elsewhere and extended to the flow over a blunted elongated body. The domain of the solution above and below the wing is represented in an original cartesian coordinate system in the form of three subdomains. Transformation of the coordinates for all three subdomains is explained. The three resulting problems are combined under the concept of finite-difference schemes and the solution of difference equations. The method is illustrated on the basis of a number of examples. Author

N85-14660# Joint Publications Research Service, Arlington, Va.
OVERVIEW OF RECENT ADVANCES IN LASER APPLICATIONS **c36**
N. G. Basov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 26-30 Transl. in ENGLISH from Trud (Moscow), no. 89 (19236), 15 Apr. 1984 p 2 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

The broad utilization of laser technology in different industries is discussed. Progress towards solving the problems of laser thermonuclear fusion is discussed. The use of optoelectronics in computer design is described. The advantages of laser welding over are welding in industry is discussed. B.W.

N85-14661# Joint Publications Research Service, Arlington, Va.
TRANSFORMATION OF ENERGY SPREAD OF LASER PUMPING VIA PHASE CONJUGATION Abstract Only **c36**
V. M. Arutyunyan, S. A. Agadzanyan, A. Zh. Muradyan, and T. A. Papazyan *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 32 refs Transl. into ENGLISH from Izv. Akad. Nauk Arm. SSR, Fiz. (Yerevan, USSR), v. 19, no. 2, Mar. - Apr. 1984 p 81-85 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

Nonlinear reflection of ultrashort high-energy laser radiation pulses leaving in the interaction space is more effective than that of continuous-wave radiation, but depends largely on the statistical spread of energy fluctuation. Therefore, transformation of the spread of pumping energy into the spread of energy in the conjugate wave plays an important role in the process. An experimental study was made of this transformation in a laser on a resonant dye of the polymethine group. The pumping source was a PPGS-1 single-mode parametric laser emitting pulses of 30-40 ps duration and 50 mJ energy. A semitransparent mirror with a reflection coefficient R = 0.45 split the laser beam into two approximately equal parts, each guided by a set of swivel prisms into a test cell with 3955 polymethine dye from exactly opposite directions a reference pumping waves, and a small part of the order of 0.04 guided by a wedge, an optical delay line, and a mirror with a reflection coefficient R = 1.0 into the interaction space as probing wave. All three coherent waves excited in the millimeter thick layer of 3955 dye in ethanol solution were equalized by means of two other optical delay lines. The results show the dependence of phase conjugation efficiency on the power density of the pumping waves, with the reflection coefficient for the conjugate wave peaking within some range of the pumping intensity and also within some range of the dye concentration. B.W.

N85-14662# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION AND ANALYSIS OF OSCILLATIONS OF THIN-WALLED SPHERICAL SHELL DURING PULSE LOADING Abstract Only **c39**
V. A. Maltsev, Yu. A. Konon, V. V. Adishchev, and V. M. Kornev *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 75-76 Transl. into ENGLISH from Fizika Goreniya Vzryva (Novosibirsk, USSR), v. 20, no. 2, Mar. - Apr. 1984 p 97-102 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

The deformation of an air-filled thin-walled spherical shell subjected to a shock wave from centrally located concentrated charges is examined experimentally. A frequency analysis is made of the oscillations excited in the shell, and the level of flexural and membrane stresses is estimated. The maximum equivalent stresses caused by the ignition of centrally located concentrated charges are found to be the same as the maximum actual stresses, and the latter exceed the estimates for the ideal statement of the problem by factors of two or three. Flexural forms of ocillations are found to have a significant contribution to the stress-strain state. The number of flexural modes of oscillations excited is limited, and their frequencies differ from that of the fundamental mode by speed and direction, air temperature, relative humidity and cloud cover. Author

N85-14663# Joint Publications Research Service, Arlington, Va.
MOLARITY PRINCIPLE: FOUNDATION FOR PARALLEL DIGITAL SIGNAL PROCESSES Abstract Only **c64**
V. M. Amerbayev and I. T. Pak *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 93 Transl. into ENGLISH from Izv. Akad. Nauk Kaz. SSR, Ser. Fiz.-Mat. (Alma-Ata, USSR), May - Jun. 1983, no. 3 p 7-10 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

An algorithm is defined as any computation procedure P sub, F sub 1, P sub 2 F sub 2,..., P sub N F sub N in which, starting with the first or any given operator, F sub 1 is executed if P sub 1 is true, or the next operator is executed if P sub 1 is false. Expansion functions are examined in which each term is a fraction with its numerator consisting of the product of the arguments and the denominator consisting of the sum of the products of the arguments. These are called S-functions. It is demonstrated that computational procedures exist that allow computation to be

performed by any S-algorithm starting with a given S-operator. The concept of universal algorithm is introduced, and a theorem that every partially recursive function is a universal algorithm is stated and proved. S-algorithms can represent all computational algorithms for partially recursive functions (with respect to G) and, if Church's thesis is correct, all algoithms for computing partial functions as well. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-14664 Missouri Univ., Rolla.
APPLICATIONS OF FINITE AND WAVE ENVELOPE ELEMENT APPROXIMATIONS TO ACOUSTIC RADIATION FROM TURBOFAN ENGINE INLETS IN FLIGHT Ph.D. Thesis
Alan Vincent Parrett 1984 142 p
Avail: Univ. Microfilms Order No. DA8418569

The problem of acoustic radiation from turbofan engine inlets in flow has not lent itself fully to analysis by numerical means because of the large domains and high frequencies involved. The use of finite elements and wave envelope elements, elements which simulate decay and wavelike behavior in their interpolation functions were extended from the no-flow case in which they were proven, to cases incorporating mean flow. By employing an irrotational mean flow assumption, the acoustics problem was posed in axisymmetric formulation in terms of acoustic velocity potential, thus minimizing computer solution storage requirements. The results obtained from the numerical procedures agree well with known analytical solutions and static jet engine inflow experimental data. Some discrepancy with flight test data exists but the combined finite element-wave envelope element solution radiation directivity trends are in good agreement with analytical predictions. Dissert. Abstr.

N85-14665 Ruhr Univ., Bochum (West Germany). Inst. fuer Mechanik.
ELEMENT METHODS FOR CALCULATION OF SOUND FIELDS Thesis [ZUR BERECHNUNG VON SCHALLFELDERN MIT ELEMENTMETHODEN]
Peter Becker Feb. 1984 153 p refs In GERMAN; ENGLISH summary
(RUB-IFM-Mitt-41) Copyright. Avail: Issuing Activity

The finite element method and boundary element method were applied to numerical calculation of sound fields. As sound generation and absorption mostly take place at the boundaries of sound fields, different boundary conditions are taken into consideration. These are: the coupling of structural vibrations with a sound field; the absorption by porous media, together with a comparison between the local and the bulk reacting absorption model; and the radiation of sound through the opening of a room. Comparative calculations for the two methods are presented. Author (ESA)

N85-14666*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SOURCES, PATHS, AND CONCEPTS FOR REDUCTION OF NOISE IN THE TEST SECTION OF THE NASA LANGLEY 4X7M WIND TUNNEL Final Report, Jul. 1983 - Mar. 1984
Richard E. Hayden and John F. Wilby Sep. 1984 325 p refs 2 Vol.
(Contract NAS1-16521)
(NASA-CR-172446-Vol-1; NAS 1.26:172446-Vol-1; BBN-5416)
Avail: NTIS HC A14/MF A01 CSCL 20A

NASA is investigating the feasibility of modifying the 4x7m Wind Tunnel at the Langley Research Center to make it suitable for a variety of aeroacoustic testing applications, most notably model helicopter rotors. The amount of noise reduction required to meet NASA's goal for test section background noise was determined, the predominant sources and paths causing the background noise were quantified, and trade-off studies between schemes to reduce fan noise at the source and those to attenuate the sound generated in the circuit between the sources and the test section were carried out. An extensive data base is also presented on circuit sources and paths. R.S.F.

N85-14667*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
COMPARISON OF OPTIONS FOR REDUCTION OF NOISE IN THE TEST SECTION OF THE NASA LANGLEY 4X7M WIND TUNNEL, INCLUDING REDUCTION OF NOZZLE AREA Final Report, May - Jun. 1984
Richard E. Hayden Sep. 1984 51 p refs 2 Vol.
(Contract NAS1-16512-14)
(NASA-CR-172446-Vol-2; NAS 1.26:172446-Vol-2; TM-AS-44)
Avail: NTIS HC A04/MF A01 CSCL 20A

The acoustically significant features of the NASA 4X7m wind tunnel and the Dutch-German DNW low speed tunnel are compared to illustrate the reasons for large differences in background noise in the open jet test sections of the two tunnels. Also introduced is the concept of reducing test section noise levels through fan and turning vane source reductions which can be brought about by reducing the nozzle cross sectional area, and thus the circuit mass flow for a particular exit velocity. The costs and benefits of treating sources, paths, and changing nozzle geometry are reviewed. Author

N85-14668# Sandia Labs., Albuquerque, N. Mex.
SIGNAL CHARACTERISTICS OF AN UNDERWATER EXPLOSIVE ACOUSTIC TELEMETRY SYSTEM
T. M. Calloway Jul. 1984 23 p refs
(Contract DE-AC04-76DP-00789)
(DE84-016653; SAND-84-0728) Avail: NTIS HC A02/MF A01

Pressure pulses from small (less than 1 gm) explosive charges detonated between depths of 150 and 1200 m and detected by hydrophones submerged at a depth of 45 m are analyzed. Experimental data on peak pressures, time constants, and shock wave/bubble pulse intervals are summarized. Time mass of each explosive is converted to its TNT energy equivalent mass, which is used in fitting semiempirical scaling laws to the data. Equations are obtained for predicting the characteristics of the signal, given the range and depth of the explosive together with its TNT energy equivalent mass. The parameter values that provide the best fit of the scaling laws to the experimental data are compared with those values applicable to larger explosives (more than 50 gm) detonated within 150 m of the surface. DOE

N85-14669# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Technische Akustik.
AMIET SHEAR LAYER CORRECTION WITH AN ADDITIONAL TEMPERATURE GRADIENT CONSIDERED: NOMOGRAMS FOR THE CORRECTION OF NOISE SIGNATURES FROM OPEN JET WIND TUNNEL TESTS
Werner Dobrzynski Mar. 1984 61 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-897)
(DFVLR-Mitt-84-11; ESA-TT-897) Avail: NTIS HC A04/MF A01

Amiet's correction scheme for sound wave transmission through shear layers is extended to incorporate the additional effects of different temperatures in the flow field and in the surrounding medium at rest. The influence of different temperatures is greatest in the direction contrary to the flow field. Within a parameter regime typical for acoustic measurements in wind tunnels, amplitude and angle-correction are calculated and plotted to provide a data base. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-14670# California Univ., Livermore. Lawrence Livermore Lab.
STATUS OF BEAM TRANSPORT WITH THE ETA AND ATA ACCELERATORS

K. W. Struve, G. J. Caporaso, Y. P. Chong, J. C. Clark, T. J. Fessenden, E. J. Lauer, D. S. Prono, J. T. Weir, and F. W. Chambers May 1984 17 p refs Presented at the Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7-11 May 1984
(Contract W-7405-eng-48)
(DE84-013205; UCRL-90242; CONF-840529-40) Avail: NTIS HC A02/MF A01

Both the Experimental Test Accelerator (ETA) and the Advanced Test Accelerator (ATA) are 10 kA electron induction linacs. The ETA produces a 4.5 MeV, 30 nsec pulse, and the ATA a 50 MeV, 70 nsec pulse. The ETA has been operational since 1979, having produced over 6 million pulses. Both the beam breakup instability and lower frequency transverse motions of the beam have been suppressed by accelerator cavity damping and with a wire damping zone. These efforts are summarized. The ATA has become operational within this last year. Full beam current operation has not yet been achieved because of low-frequency transverse motion and centroid drift of the beam. The beam breakup instability has also been observed but does not disrupt the beam. Efforts at finding the source of the drift and low frequency motion, as well as wire damping of these motions, are reported. DOE

N85-14671# Language Services, Knoxville, Tenn.
MEASUREMENT OF SCATTERING CROSS SECTIONS OF LIQUID AND SOLID HYDROGEN DEUTERIUM AND DEUTERIUM HYDRIDE FOR THERMAL NEUTRONS Thesis - 3 Oct. 1969 Technical Univ., Munich
W. D. Seiffert (EAC-Euratom, Brussels) 1984 39 p refs Prepared for ORNL, Tenn.
(Contract DE-AC05-84OR-21400)
(DE84-014814; ORNL-TR-5153; EUR-4455) Avail: NTIS HC A03/MF A01

The scattering cross sections or liquid and solid normal hydrogen, para-hydrogen, deuterium and deuterium hydride were measured for thermal neutrons at various temperatures. Solid samples of para-hydrogen exhibit distinct Bragg scattering. Liquid samples of deuterium and para-hydrogen also exhibit distinct coherence phenomena, which is indicative of strong local ordering of the molecules. In para-hydrogen and deuterium hydride, the threshold for scattering with excitation of rotations is distinctly visible. The positions of the thresholds show that the molecules in liquid hydrogen are not unhindered in their movement. After the beginning of the rotational excitation the scattering cross sections of liquid and solid para-hydrogen have different shapes which is to be explained by the differences in the dynamics of the liquid and the solid specimen. DOE

N85-14672# Purdue Univ., Lafayette, Ind. Dept. of Physics.
MOTION OF ELECTRONS IN NON POLAR CLASSICAL LIQUIDS Final Report, 1 May 1979 - 30 Jun. 1984
G. Ascarelli Jun. 1984 11 p refs
(Contract DE-AC02-79ER-10375)
(DE84-013609; DOE/ER-10375/4) Avail: NTIS HC A02/MF A01

The motion of electrons in insulating liquids was studied from both a theoretical and an experimental angle. The experimental aims of the program were to develop a technique to measure the Hall mobility of injected electrons in an insulating liquid and to develop a measurement of the density of localized states within a few kT from the conduction band edge. The measurement of the Hall mobility of electrons injected in liquids was very successful. Results from these experiments confirm the expected importance of localized states in the liquid. Direct measurement of the density of localized states below the conduction band edge of rare gasses was unsuccessful. Through theoretical work, it was possible to explain the apparent saturation of the time of flight (TOF) velocity in rare gasses, the increase of the saturation TOF velocity by the addition of impurities to rare gasses, as well as the electric field induced variation of the probability of capture of an electron by an impurity. R.S.F.

N85-14673# Oregon Univ., Eugene. Inst. of Theoretical Science.
PARTICLE PHYSICS Annual Report
M. J. Moravcsik 1984 12 p
(Contract DE-AT06-76ER-70004)
(DE84-013834; DOE/ER-70004/382) Avail: NTIS HC A02/MF A01

Accomplishments are briefly summarized in these areas: proton fragmentation in deep inelastic scattering, heavy ion collisions, factorization in the Drell-Yan process, looking for glueballs in heavy quarkonia decays, electric dipole moment of the neutron in a Higgs exchange model of CP nonconservation, left-right symmetry and CP violation, breaking of SU(5) supergravity, strong magnetic field in broken gauge theories, the polarization structure of particle reactions, X-ray laser pumped by radiation from storage rings, superfine X-ray gratings, and novel mechanisms of particle acceleration. Also summarized are papers on the uniqueness of supersymmetry for cancellation of quadratic divergencies and CP violation through Higgs exchange. Publications are listed. DOE

N85-14674# California Univ., Livermore. Lawrence Livermore Lab.
TOWARD UNIFICATION OF ELEMENTARY PARTICLE PHYSICS AND COSMOLOGY IN 10-DIMENSIONS
George Chapline and Gary Gibbons (Cambridge Univ., England) 14 Jun. 1984 8 p refs Presented at the 8th Johns Hopkins Conf. on Particle Phys., Baltimore, 20 Jun. 1984
(Contract W-7405-eng-48)
(DE84-013950; UCRL-90924; CONF-8406172-1) Avail: NTIS HC A02/MF A01

Ten-dimensions seem to be a unique setting for unifying at the classical level cosmology and elementary particle physics. Some interesting results along these lines are obtained starting with a Yang-Mills coupled to supergravity theory in 10-dimensions. However, further progress will require finding a underlying quantum theory. DOE

N85-14675# Stanford Linear Accelerator Center, Calif.
ENERGY SPREAD IN SLC LINAC WITH LANDAU DAMPING
John Seeman 22 Aug. 1984 9 p refs
(Contract DE-AC03-76SF-00515)
(DE84-016259; SU-SLAC-CN-278) Avail: NTIS HC A02/MF A01

The possibility of using Landau damping to reduce the growth of the beam size due to transverse wake fields was known for some time. Recently K. Bane has calculated the effects of Landau damping for the SLC. The energy spread is then slowly removed so that at the end of the linac it has returned to the SLC specification of less than +0.5%. The purpose of the energy spread is to reduce the resonant driving of the tail of the bunch by the head. The expected energy spreads within the beam are tabulated at various positions along the linac for use by those people designing momentum dependent equipment and for those interested in Landau damping. DOE

N85-14676# Stanford Linear Accelerator Center, Calif.
MINIMIZING THE ENERGY SPREAD WITHIN A SINGLE BUNCH BY SHAPING ITS CHARGE DISTRIBUTION
Gregory Loew and Juwen Wang Jun. 1984 5 p refs
(Contract DE-AC03-76SF-00515)
(DE84-016172; SU-SLAC/AP-25) Avail: NTIS HC A02/MF A01

When electrons or positrons in a bunch pass through the periodic structure of a linear accelerator, they leave behind them energy in the form of longitudinal wake fields. The longitudinal fields left behind by early particles in a bunch decrease the energy of later particles. For a linear collider, the energy spread introduced within the bunches by this beam loading effect must be minimized because it limits the degree to which the particles can be focused to a small spot due to chromatic effects in the final focus system. For example, for the SLC, the allowable energy spread is + or - 0.5%. It has been known for some time that partial compensation of the longitudinal wake field effects can be obtained for any bunch by placing it ahead of the accelerating crest (in space), thereby letting the positive rising sinusoidal field offset the negative beam loading field. The work presented shows that it is possible to obtain complete compensation, i.e., to reduce the energy spread essentially to zero by properly shaping the longitudinal charge

distribution of the bunch and by placing it at the correct position on the wave. DOE

N85-14677# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
SCATTERING EXPERIMENTS ON INTERACTIONS OF EXCITED ATOMS: DIFFERENTIAL CROSS SECTIONS OF THE SYSTEM Na (3P)+K(4S) Thesis [STREUEXPERIMENTE ZUR WECHSELWIRKUNG VON ANGEREGTEN ATOMEN: DIFFERENTIELLE QUERSCHNITTE DES SYSTEMS Na (3P)+K(4S)]
Wolfgang Groeger May 1984 104 p refs In GERMAN
(MPIS-8/1984; ISSN-0436-1199) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,40

The interactions of two alkali-atoms in a molecular beam scattering experiment at thermic energies were studied. Differential cross sections for the scattering of Na(3S) and Na(3P) at K(4S) were measured. For the electronic excited system Na(3P)-K(4S) the energy distribution of the Na atoms after the collision was determined under selected angles. The measuring device uses a speed-selected sodium beam, an unselected potassium beam and the light of a single-mode dye laser. A generator switches the laser on and off rapidly on periodic sequences, which enables accurate measurements based on the principle of digital lock-in to be made. Author (ESA)

N85-13887*# Department of Energy, Washington, D. C.
RADIOISOTOPE SPACE POWER PROGRAMS
Bernard J. Rock *In* NASA. Lewis Research Center Space Power Apr. 1984 p 75-84 (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 18L

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-14678# Stanford Linear Accelerator Center, Calif.
MEASUREMENTS OF THE A-DEPENDENCE OF DEEP-INELASTIC ELECTRON SCATTERING FROM NUCLEI
R. G. Arnold (American Univ., Washington, D.C.), P. E. Bosted (American Univ., Washington, D.C.), C. C. Chang (Maryland Univ., Coll. Park), J. Gomez (American Univ., Washington, D.C.), A. T. Katramatou (American Univ., Washington, D.C.), G. G. Petratos (American Univ., Washington, D.C.), A. A. Rahbar (American Univ., Washington, D.C.), S. E. Rock (American Univ., Washington, D.C.), A. F. Sill (American Univ., Washington, D.C.), and Z. M. Szalata (American Univ., Washington, D.C.) May 1984 14 p refs Presented at the 22nd Intern. Conf. on High Energy Phys., Leipzig, 19-25 Jul. 1984
(Contract DE-AC03-76SF-00515)
(DE84-013865; SU-SLAC-PUB-3348; CONF-840757-1) Avail: NTIS HC A02/MF A01

The deep inelastic electron scattering cross sections per nucleon sigma sub A for d, He, C, Al, Ca, Fe, Ag, and Au were measured in the kinematic range 0.09 less than or equal to x less than or equal to 0.9 and 2 less than or equal to Q(2) less than or equal to 15 (GeV/c) (2) using electrons with energies ranging from 8 to 24.5 GeV. The ratio sigma sub A sigma sub d is consistent with unity in the range 0.1 , x , 0.3. For 0.3 , x , 0.8, the ratio decreases logarithmically with atomic weight A, or linearly with average nuclear density. No Q(2) dependence in the ratio was observed over the kinematic range of the data. This is interpreted as evidence for a change in the quark momentum distribution in the nucleus due to the presence of 6 quark clusters or a larger nucleon bag size. DOE

N85-14679# Los Alamos Scientific Lab., N. Mex.
SPACE NUCLEAR SAFETY PROGRAM Monthly Progress Report, Feb. 1984
S. E. Bronisz, comp. Jul. 1984 25 p refs
(Contract W-7405-eng-36)
(DE84-016973; LA-10190-PR) Avail: NTIS HC A02/MF A01

The use of Pu238O2 in radioisotope power systems is studied. Impact tests of the General Purpose heat source is examined as is impact and high pressure seawater aging tests of the Light Weight Radioisotope Heater Unit. Emission spectrographic analysis was performed for impurity elements. E.R.

N85-14680# Groningen Rijksuniversiteit (Netherlands). Kernfysisch Versneller Inst.
[ACTIVITIES REPORT IN NUCLEAR PHYSICS] Annual Report, 1983
J. F. W. Jansen, ed. and A. G. Drentje, ed. 1983 164 p refs
Avail: NTIS HC A08/MF A01

The main thrust of nuclear physics research is the investigation of giant resonances, the study of single and multinucleon transfer and carge exchange reactions. The investigation of light ion breakup, of incomplete fusion reactions and of particle-particle correlations in nucleus-nucleus collisions, and of in and off beam gamma ray and conversion electron spectroscopy is reported. Other areas of study include electromagnetic and weak interactions, theoretical nuclear physics, atomic physics, nuclear solid state physics, cyclotron experiments, nuclear medicine and environmental studies. Author (GRA)

N85-13893*# GA Technologies, Inc., San Diego, Calif.
TECHNOLOGY STATUS OF THERMIONIC FUEL ELEMENTS FOR SPACE NUCLEAR POWER
J. W. Holland and L. Yang *In* NASA. Lewis Research Center Space Power Apr. 1984 p 157-169 refs (For primary document see N85-13880 05-20)
Avail: NTIS HC A14/MF A01 CSCL 18K

74 OPTICS

Includes light phenomena.

N85-14681# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
MULTI-DISCIPLINARY TECHNIQUES FOR UNDERSTANDING TIME-VARYING SPACE-BASED IMAGERY Annual Report, 1 May 1983 - 30 May 1984
D. Casasent, A. Sanderson, and T. Kanade 1 Jun. 1984 160 p
(Contract F49620-83-C-0100)
(AD-A144357; FCSR-84-0597TR) Avail: NTIS HC A08/MF A01 CSCL 20/6

A multidisciplinary program for space-based image processing is reported. This project combines optical and digital processing techniques and pattern recognition, image understanding and artificial intelligence methodologies. Time change image processing was recognized as the key issue to be addressed. Three time change scenarios were defined based on the frame rate of the data change. This report details the recent research on: various statistical and deterministic image features, recognition of sub-pixel targets in time varying imagery, and 3-D object modeling and recognition. Author (GRA)

N85-14682# Department of the Navy, Washington, D. C.
ELECTROOPTICAL MATRIX MULTIPLICATION USING THE TWOS COMPLEMENT ARITHMETIC FOR IMPROVED ACCURACY Patent Application
R. P. Bocker, S. R. Clayton, and K. Bromley, inventors (to Navy) Filed 21 May 1984 20 p
(AD-D011252; US-Patent-Appl-SN-612288) Avail: NTIS HC A02/MF A01 CSCL 20/6

This invention is directed to providing an apparatus and method for improving accuracy in an electooptical matrix-matrix multiplier by using twos complement arithmetic. A source of pulsed collimated light illuminates a first matrix of optical encoded information of numbers in the twos complement binary representation and a second matrix of optical encoded information of numbers in the

twos complement binary representation that mutually orthogonally are displaced with respect to one another in synchronization with the pulsing of the collimated light source. A photodetector array is located to add multiplied encoded information of numbers in the twos complement binary representation of the first matrix providing means and the second matrix providing means to be expressed as mixed binary representation signals. A suitable decoder is coupled to the photodetector array for decoding the mixed binary representation signals into twos complement binary representations or digital representations for use by interconnected processing devices. Staggering the encoded twos complement binary representations of one matrix of information and orthogonally advancing it with respect to the other matrix of information allows the addition of multiplied mixed binary representations by the photodetector array to provide accurate representations of decimal mathematical numbers. GRA

N85-14683# Department of the Navy, Washington, D. C.
ADVANCED CUBE PROCESSOR Patent Application
R. P. Booker, inventor (to Navy) Filed 29 Jun. 1984 14 p (AD-D011262; US-Patent-Appl-SN-626506) Avail: NTIS HC A02/MF A01 CSCL 20/6

An apparatus and method provide for the electrooptic performing of matrix-matrix multiplication, computation of the cross-ambiguity function and calculation of triple correlations. A collimated light source is pulsed to illuminate a first matrix of optically encoded information. Since the first matrix functions in the transmissive mode the same pulsed light is deflected by a polarizing beam splitter to a second matrix of optically encoded information. This matrix, functioning in the reflective mode reflects the pulsed, collimated light back through the beam splitter onto a third matrix of optically encoded information. The third matrix is operated in the reflective mode and reflects the pulsed, collimated light back to the polarizing beam splitter and onto a two-dimensional photodetector array. The photodetector array adds the successively arithmetically processed encoded informations from the first, second and third matrices of information. The information of the first matrix is advanced across the light path from the pulsed, collimated light source and the encoded information from the second and third matrices are advanced across opposite faces of the polarizing beam splitter in a mutually orthogonally displacement with respect to one another. Optionally, the information in the first matrix can be advanced across the path of the pulsed collimated light at right angles to that described above the effect substantially the same mathematical operations called for above. Author (GRA)

N85-14684# Department of the Air Force, Washington, D.C.
FLY'S EYE SENSOR NONLINEAR SIGNAL PROCESSING Patent Application
R. T. Schneider, inventor (to Air Force) Filed 13 Jun. 1984 34 p (AD-D011290; US-Patent-Appl-SN-620211) Avail: NTIS HC A03/MF A01 CSCL 20/6

This document describes a multiaperture fly's eye optical signal transducing apparatus employing nonlinear electrical signal processing located adjacent the optical transducers in a multifunction integrated circuit device. The processed signals have enhanced low-level contrast and attenuated high contrast. Utilization examples, mathematical equations and related characteristic curves are also included along with exemplary circuit diagrams. Author (GRA)

N85-14685# California Univ., Livermore. Lawrence Livermore Lab.
GAMMA-RAY TO CERENKOV-LIGHT CONVERSION EFFICIENCY FOR PURE-SILICA-CORE OPTICAL FIBERS
B. L. Pruett, R. T. Peterson, D. E. Smith, L. D. Looney (Los Alamos National Lab.), and R. N. Shelton, Jr. (Los Alamos National Lab.) Jul. 1984 9 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19-24 Aug. 1984
(Contract W-7405-eng-48)
(DE84-015041; UCRL-90495; CONF-840872-3) Avail: NTIS HC A02/MF A01

The absolute gamma-ray to Cerenkov-light conversion efficiency for pure-silica-core optical fibers in the vicinity of metallic Compton-converter slabs was determined experimentally. To measure the energy dependence of this process, Co-60 and -24 Na radiation sources were used. The results show how the conversion efficiency varies with Compton-converter material, thickness, angle of the fiber, and fiber-converter distance. Computer calculations of conversion efficiency were performed. This method employs an electron-photon transport code named SANDYL together with analytical calculations of Cerenkov-light generation. The results of these calculations are compared with experimental results. DOE

N85-14686# Los Alamos Scientific Lab., N. Mex.
100 MHz FIBER OPTIC SINGLE TRANSIENT GAMMA RAY DETECTION SYSTEM
J. W. Ogle, R. C. Smith, M. Ward, R. Ramsey, and J. Hollabaugh 1984 8 p refs Presented at SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984 Prepared in cooperation with Edgerton, Germashausen and Grier, Inc., Los Alamos, N. Mex.
(Contract W-7405-eng-36)
(DE84-016818; LA-UR-84-2594; CONF-840872-18) Avail: NTIS HC A02/MF A01

A fiber optic system was developed to measure single transient gamma rays. The gamma ray signature is converted to light by the Cerenkov process in a 20 cm length of radiation resistant optical fiber. The signal is transmitted over 1 km of optical fiber and detected by state-of-the-art, 175 MHz analog receivers. The receivers are based on silicon PIN detectors with transimpedance hybrid amplifiers and two stages of power amplification. The dc coupled receivers have less than 2% distortion up to 5 volts with less than 10 mV rms noise and a responsivity of 37,500 V/watt at 800 nm. A calibration system measures relative fiber to fiber transit time delays and system sensitivity. System bandwidth measurements utilized an electron linear accelerator (linac) with a 50 ps electron pulse as the Cerenkov light source. DOE

N85-14687# Los Alamos Scientific Lab., N. Mex.
TRANSIENT ATTENUATION IN OPTICAL FIBERS
A. A. Hopkins, L. D. Looney, and P. B. Lyons 1984 9 p refs Presented at SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984
(Contract W-7405-eng-36)
(DE84-016487; LA-UR-84-2470; CONF-840872-20) Avail: NTIS HC A02/MF A01

Low and high energy pulsed electron beams were used to generate radiation induced transient attenuation in high OH, Suprasil core, PCS fibers, demonstrating the energy dependence of the radiation damage and recovery mechanisms. A radiation resistant low OH fiber was studied and its performance contrasted to that of high OH materials. Several fibers with differing core compositions were also studied. DOE

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-14688# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OBSERVATIONS OF PLASMA BUBBLES AND THEIR ZONAL DRIFT USING POLARIMETERS [OBSERVACOES DE BOLHAS DE PLASMA E DE SUA DERIVA ZONAL USANDO POLARIMETROS]
M. A. Abdu, I. S. Batista, E. R. dePaula, J. H. A. Sobral, and I. J. Kantor Aug. 1984 18 p refs In PORTUGUESE; ENGLISH summary
(INPE-3219-PRE/572) Avail: NTIS HC A02/MF A01

Amplitude scintillation and Faraday rotation angle fluctuations of satellite VHF beacon are registered by electronic polarimeters in Cachoeira Paulista and Sao Jose dos Campos. These two stations are located in the same magnetic latitude, 110 km apart, and that permits determination of the irregularity patch occur-

rence characteristics and their zonal velocities. Analysis for equinoctial and summer months, under varying levels of magnetic disturbances, was made. The scintillation patch occurrences, and TEC fluctuations representing plasma depletion structures, decrease during premidnight hours, and are enhanced in the postmidnight period, the occurrence often extending to morning hours, with increasing magnetic activity index. While the night events are associated with eastward irregularity patch motion, the morning events have westward velocities (the reversal occurring around 04LT), reflecting the morning reversal in the F region bulk plasma motion reported earlier from Jicamarca radar measurements. Another result from this analysis is that the plasma bubble velocity shows a tendency to undergo increases immediately following increases in magnetic activity levels. Author

N85-14689# Rochester Univ., N. Y. Lab. for Laser Energetics.
NON-LTE CONSIDERATIONS IN SPECTRAL DIAGNOSTICS OF THERMAL TRANSPORT AND IMPLOSION EXPERIMENTS
R. Epstein, S. Skupsky, J. Delettrez, and B. Yaakobi 1984 12 p Presented at the 14th Ann. Anomalous Absorption Conf., Charlottesville, Va., 6-11 May 1984
(Contract DE-AC08-80DP-40124)
(DE84-015187; DOE/DP-40124/31; CONF-8405163-6) Avail: NTIS HC A02/MF A01

Recent thermal-transport and target-implosion experiments have used the emission of radiation from highly-ionized ions to signal the advance of laser-driven heat fronts and to mark the trajectories and stagnation points of imploding shells. The results of such experiments are examined with particular attention given to non-LTE effects of non-Maxwellian electrons and of finite ionization times on the populations of signature-emitting atomic species and on the formation of signature spectra and X-ray images in these experiments. DOE

N85-14690# Language Services, Knoxville, Tenn.
EQUATIONS OF PLASMA TRANSPORT IN A CURVED MAGNETIC FIELD
A. B. Mikhailovskii and V. S. Tspin 1984 31 p refs Transl. into ENGLISH of "Uravneniya Perenosa Plazmy v Krivolineinom Magnitnom Pole" Rept. IAE-3751/6 Inst. of Atomnoj Ehnergii, Moscow, 1983 p 1-27
(Contract DE-AC05-84OR-21400)
(DE84-015625; ORNL-tr-5145) Avail: NTIS HC A03/MF A01

The problem of the transport equations of a collisional plasma in a curved magnetic field was investigated. The two main approaches to this problem are presented: one is based on use of the Boltzmann equation, and the other on the drift kinetic equation. A multimoment system of transport equations more general than those of Braginskii and Grad is derived within the framework of the first approach. The tensor equations of this system are written in an arbitrary curvilinear coordinate system; this makes it possible to use these equations in problems involving plasma confined in toroidal magnetic configurations. The multimoment system of transport equations is simplified for the case of a strong magnetic field. DOE

N85-14691# McElroy (Ralph) Co., Austin, Tex.
APPLICATION OF THE ENERGY PROBLEM TO THE PROBLEM OF PLASMA FLOW STABILITY
V. P. Nagornyi and G. V. Stupakov Jun. 1984 28 p refs Transl. into ENGLISH of "O Primenenii Energeticheskogo Printsipa k Zadache ob Ustoichivosti Techniya Plazmy" Preprint 83-102 Novosibirsk
(Contract W-7405-eng-48)
(DE84-013359; UCRL-Trans-11975; Preprint-83-102) Avail: NTIS HC A03/MF A01

The properties of an equation describing the evolution of small perturbations are examined. Requirements are found which must be satisfied by system with flow for the energy principle to be applicable to it. It is shown within the limit of low plasma pressure that a system of connected mirror cells satisfies the necessary requirements and for it the criterion of stability relative to flute perturbations is formulated. DOE

N85-14692# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
STABILIZATION OF THE HOT ELECTRON PRECESSIONAL MODE IN A SYMMETRIC TANDEM MIRROR BY THE AXIAL VARIATION OF RADIAL ELECTRIC FIELD
Kang T. Tsang and X. S. Lee Jul. 1984 17 p refs
(Contract DE-AC03-76ET-53057)
(DE84-016389; SAI-84-1708/PRI-80) Avail: NTIS HC A02/MF A01

The stability of the hot electron precessional mode is investigated in the presence of a relative E x B precession between the end cell and the center cell, which is inherent to the tandem mirror concept. It is found that a positive radial electric field in the end cell is favorable to stability. Under normal condition, the stability of a hot electron symmetric tandem mirror is not worse than a quadrupole tandem mirror with the same relative E x B precession. DOE

N85-14693# California Univ., Los Angeles.
IMAGING POLARIMETER-INTERFEROMETER ARRAYS FOR TOKAMAK MEASUREMENTS Progress Report
1984 29 p
(Contracts DE-AT03-76ET-53019; DE-AM03-76SF-00010)
(DE84-015916; DOE/ET-53019/T3) Avail: NTIS HC A03/MF A01

The Task IIIB program had continued to make significant strides during the last year. Laboratory test studies continued in development efforts on imaging polarimeter and interferometer arrays in support of the Tokamak measurements carried out under Task IIIA. This work ensures that the system optics and resolution are completely understood prior to attempting actual Tokamak measurements. New microbolometer designs and fabrication techniques increased their sensitivity by over an order of magnitude compared with the previous devices. In addition, the development of sensitive monolithic integrated Schottky diode detector arrays has shown rapid progress. Heterodyne noise temperature of less than 9000 K have already been achieved at 94 GHz with extension into the submillimeter region anticipated during the coming year. DOE

N85-14694# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
ELMA BUMPY TORUS PHYSICS Final Report, May 1983 - Aug. 1984
24 Aug. 1984 102 p refs
(Contract DE-AC05-83ER-51035)
(DE84-015909; MDC-E-2805) Avail: NTIS HC A06/MF A01

Work done in EBT physics from May 1983 through August 1984 is reported. Because of developments in the EBT program during the course of this contract, some of the original tasks were modified to better reflect priorities in the EBT research program. The work covered in this report is in three areas: (1) experiments on EBT-S to improve plasma parameters through operation with pulsed heating power and neutral density; (2) studies of ion ring formation and power balance to assess their potential for improving reactor performance; and (3) studies of advanced toroidal concepts that might lead to a more favorable reactor concept. DOE

N85-14695# Department of Energy, Washington, D. C. Office of Fusion Energy.
COMPACT TORROIDAL DEVELOPMENT: ACTIVITY PLAN FOR FIELD REVERSED CONFIGURATIONS
Jun. 1984 18 p refs
(DE84-017145; DOE/ER-0197) Avail: NTIS HC A02/MF A01

The description, goals, status, plans, and approach for the investigation of the properties of a magnetic configuration for plasma confinement identified as the field reversed configuration (FRC) are given. This component of the magnetic fusion development program has been characterized by its potential for physical compactness and a flexible range of output power. The included material represents the second phase of FRC program planning. The first was completed in February 1983, and was reported in DOE/ER-0160; Compact Toroid Development. This planning builds on that previous report and concentrates on the detailed plans

for the next several years of the current DOE sponsored program. It has been deliberately restricted to the experimental and theoretical efforts possible within the present scale of effort. A third phase of this planning exercise is to examine the subsequent effort and resources needed to achieve near term (1987 to 1990) FRC technical objectives. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-14696# Department of the Air Force, Washington, D.C.
LPE (LIQUID PHASE EPITAXY) SEMICONDUCTOR MATERIAL TRANSFER METHOD Patent Application
F. Z. Hawrylo, inventor (to Air Force) Filed 30 Jul. 1984 12 p (AD-D011250; US-Patent-Appl-SN-635393) Avail: NTIS HC A02/MF A01 CSCL 20/12

A method for liquid phase epitaxy maskless deposition of a 3-5 compound on a substrate in a pre-determined pattern is described which includes the steps of contacting a growth wafer having a patterned mask thereon to a growth solution in equilibrium and then increasing the temperature of the growth solution and wafer thereby locally melting the exposed portions of the wafer surface and locally changing the equilibrium properties of the growth solution. The substate upon which the material is to be deposited is then contacted to the growth solution and the temperature lowered. Because of the locally varying equilibrium conditions the constituents of the growth solution will be preferentially deposited on those portions of the growth wafer. Author (GRA)

N85-14697# Department of the Navy, Washington, D. C.
RADIATION HARDENED ION-IMPLANTED GaAs FIELD EFFECT TRANSISTOR AND METHOD FOR MAKING THE SAME SPECIFICATION Patent Application
E. E. King and W. T. Anderson, Jr., inventors (to Navy) Filed 18 Jul. 1983 0018p
(AD-D011264; US-Patent-Appl-SN-514891) Avail: NTIS HC A02/MF A01 CSCL 18/6

The present Invention is directed to a novel gallium arsenide field effect transistor and, more particularly, to a novel gallium arsenide field effect transistor which exhibits greatly improved tolerance to the effects of pulsed ionizing radiation. GRA

N85-14698# Illinois Univ., Urbana.
TRANSPORT AND RELAXATION PROCESSES IN SUPERCRITICAL FLUIDS Technical Progress Report, 1 Oct. - 31 Dec. 1983
Jiri Jonas 1984 16 p
(Contract DE-FG22-82PC-50800)
(DE84-006591; DOE/PC-50800/T5) Avail: NTIS HC A02/MF A01

Work continued according to the initial research plans in three main areas: (1) instrumentation for solubility measurements of solids in supercritical fluids; (2) transport in supercritical fluids; and (3) laser Raman scattering studies of collision induced scattering. These experiments yield direct information about intermolecular forces. A theoretical interpretation of the experimental data on diffusion in supercritical ethylene is presented and progress reports are given for the following: (1) testing and revision of NMR probe for solubility measurements; (2) installation and testing of high pressure densitometer for supercritical fluids; and (3) collision induced scattering in supercritical sulfur hexafluoride. DOE

N85-14699# Sandia Labs., Albuquerque, N. Mex.
PHASE DIAGRAMS OF ORGANIC SUPERCONDUCTORS
J. E. Schirber, L. J. Azevedo, and J. M. Williams (Argonne National Lab.) 1984 6 p refs Presented at the Intern. Conf. on the Phys. and Chem. of Low-Dimensional Synthetic Metals, Abano-Terme, Italy, 17 Jun. 1984
(Contracts DE-AC04-76DP-00789; W-31-109-eng-38)
(DE84-016219; SAND-84-0549C; CONF-8406192-1) Avail: NTIS HC A02/MF A01

A contactless technique was developed for tracking the metallic, spin density wave and superconducting ground states of organic superconductors as a function of pressure and temperature. DOE

N85-14700# Illinois Univ., Urbana. Dept. of Physics.
MOMENTUM DISTRIBUTIONS IN SUPERFLUID HELIUM: BOSE CONDENSATE FRACTION
P. E. Sokol, R. O. Simmons, D. L. Price (Argonne National Lab.), and R. O. Hilleke (Argonne National Lab.) May 1984 4 p refs Presented at the Symp. on Neutron Scattering, Berlin, Aug. 1984
(Contracts DE-AC02-76ER-01198; W-31-109-eng-38)
(DE84-014676; CONF-840874-1) Avail: NTIS HC A02/MF A01

The momentum distributions in superfluid and normal Helium 4 at identical densities using inelastic neutron scattering as a function of temperature and density was measured. At large enough momentum transfers Q the impulse approximation is valid and the single particle momentum distribution n(anti p) can be extracted from the inelastic scattering spectrum. Results are reported. DOE

N85-14701# Sandia Labs., Albuquerque, N. Mex.
PHOTOLUMINESCENCE STUDIES OF Ga(As,P) STRAINED-LAYER SUPERLATTICES
Paul L. Gourley 13 Aug. 1984 4 p refs
(Contract DE-AC04-76DP-00789)
(DE84-015709; SAND-84-0610C; CONF-840875-1) Avail: NTIS HC A02/MF A01

Strained Layer Superlattices (SLS's) are semiconductor multilayers composed of thin (approx. 100 A) alternating layers of lattice mismatched materials. The layers are thin enough that they coherently strain themselves to align atoms across the interfaces and avoid misfit dislocations. The layers are grown alternately in tension and compression to form thick (approx. 1 micro m) structures. SLS's have been produced by both molecular beam epitaxy and metal organic chemical vapor deposition (MOCVD) growth techniques. The high quality of these SLS structures has been verified by a number of materials characterization techniques. Because the SLS layers are thin, they possess the quantum size effects that have been extensively studied in superlattice and multiple quantum well structures composed of lattice matched semiconductors. However, the SLS's have the additional freedom to combine lattice mismatched materials, making available a much wider range in materials and electronic properties. Furthermore, these SLS's have the additional feature of a built in strain which modifies energy band structure. These features allow SLS band structure to be engineered for a specific application. Recently, the first theoretical and experimental studies of Ga(As,P) SLS optical properties were reported. DOE

N85-14702# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Physics.
RAMAN STUDY OF NEUTRON IRRADIATED GaAs
R. S. Berg, P. Y. Yu, and E. R. Weber Jul. 1984 9 p refs Presented at the 17th Intern. Conf. on the Phys. of Semiconductors, San Francisco, 6-10 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-016056; LBL-18108; CONF-840879-2) Avail: NTIS HC A02/MF A01

Raman scattering with near band gap excitation has been used to study fast neutron damaged GaAs. In addition to disorder-activated first order scattering from zone edge acoustic phonons, a new peak was observed that is attributed to a resonant mode associated with an intrinsic defect of GaAs, and As vacancy being the most likely candidate. DOE

N85-14703# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
THE ATOMIC STRUCTURE OF SI-SIO2 INTERFACES SUGGESTING A LEDGE MECHANISM OF SILICON OXIDATION
J. H. Mazur and J. Washburn Jul. 1984 6 p refs Presented at the 17th Intern. Conf. on Phys. of VLSI, Palo Alto, Calif., 1-8 Aug.

1984
(Contract DE-AC03-76SF-00098)
(DE84-016057; LBL-18119; CONF-840879-3) Avail: NTIS HC A02/MF A01

The atomic structure of Si-SiO2 interfaces resulting from oxidation of singular [111] and vicinal (111)3(0)[1 anti 10] and (111)2(0)[11 anti 2] was studied by high resolution electron microscopy. The transition from crystalline Si to amorphous SiO2 was found to be very abrupt. The structure of the interface is described by a terrace-ledge-kink-model. This structure is consistent with a ledge mechanism of silicon oxidation. DOE

N85-14704# Mission Research Corp., Albuquerque, N. Mex.
REPETITIVELY PULSED METAL ION BEAMS FOR ION IMPLANTATION
R. J. Adler and S. T. Picraux (Sandia Labs., Albuquerque, N. Mex.) 1984 23 p refs Presented at the 5th Intern. Conf. on Ion Implantation Equipment and Tech., Jeffersonville, Vt., 23 Jul. 1984 Sponsored in part by NSF
(Contract DE-AC04-76DP-00789)
(DE84-014065; SAND-84-0815C; CONF-840769-1) Avail: NTIS HC A02/MF A01

Recently developed techniques for producing high current, pulsed ion beams have suggested the possibility of a pulsed implanter technology. Potential advantages of such an approach include lower capital costs, and higher average beam currents for applications requiring metal ions which are difficult to produce in conventional DC sources. We report here the development of a prototype 80 kV pulsed implanter. This implanter runs at 32 pulses per second, 2 amperes (titanium) peak ion current, a 6 (MU)sec accelerating pulse length, and approx. 100 (MU)A titanium particle current. Significant currents have been demonstrated for copper and carbon; ions from any conducting solid can be used in the ion source. The characteristics of the source are discussed along with implanter operating data. Our results suggest that the accelerating gap runs in a primarily source dominated mode. The absolute beam currents and charge state are characterized by surface analysis of implanted samples. Techniques for scaling this technology to high >20 mA average currents are discussed. DOE

N85-14705# Sandia Labs., Albuquerque, N. Mex. Ion-Solid Interactions Div.
CONTAMINATION ANALYSIS OF TI-O2 THIN FILMS DEPOSITED USING ION ASSISTED DEPOSITION
G. A. Al-Jumaily (N. Mex. Univ., Albuquerque), S. R. Wilson (N. Mex. Univ., Albuquerque), A. C. Barron (N. Mex. Univ., Albuquerque), J. R. McNeil (N. Mex. Univ., Albuquerque), and B. L. Doyle 1984 13 p refs Presented at the Ion Beam Modification of Mater. Conf., Ithaca, N. Y., 16 Jul. 1984
(DE84-014944; SAND-84-0526C; CONF-840760-3) Avail: NTIS HC A02/MF A01

Elastic backscattering and recoil detection techniques were used to analyze TiO2 films for possible contaminants introduced during O2(+) ion assisted deposition. The principal impurities (H, C and W) together with the RiO2 film stoichiometry were monitored as a function of O2(+) ion energy (60 to 500 eV), O2(+) current density (0 to 150 (MU)A/cm(2)) and the substrate temperature (50 to 250 C). The main findings were: (1) TiO2 film stoichiometry improved with increasing O2(+) current except for the case of low temperature and high O2(+) energy, (2) levels were directly proportional to O2(+) current, (3) C contamination increased at the higher temperatures, and (4) the H levels were relatively insensitive to the deposition parameters. The last two findings indicate that the source of H and C contamination were residual gases in the vacuum chamber. DOE

N85-14706# Sandia Labs., Albuquerque, N. Mex.
InAsSb STRAINED-LAYER SUPERLATTICES (SLSs) FOR LONG WAVELENGTH DETECTOR APPLICATIONS
G. C. Osbourn and T. E. Zipperian 1984 8 p Presented at the IRIS Speciality Group on Infrared Detectors, Seattle, 14 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-016111; SAND-84-0854C; CONF-840880-1) Avail: NTIS HC A02/MF A01

InAsSb strained layer superlattices (SLS's) are proposed as novel III-V semiconductor materials with the potential for long wavelength intrinsic detector applications. Theoretical studies indicate that the wavelength cutoff of InAs(04)Sb(06)/InAs(1-y) Sb(y) at 77K through the intentional use of layer strains. These new materials may avoid many of the growth and stability problems associated with HgCdTe and may lead to more reproducible and dependable long wavelength IR arrays. DOE

N85-14707# California Univ., Livermore. Lawrence Livermore Lab.
POWER MOS FAST SWITCHING TECHNIQUES
J. A. Oicles and G. J. Krausse (Los Alamos Scientific Lab., N. Mex.) Jul. 1984 15 p refs Presented at the 16th Power Modulator Symp., Arlington, Va., 18-20 Jun. 1984
(Contract W-7405-eng-48)
(DE84-015046; UCRL-91238; CONF-8406137-17) Avail: NTIS HC A02/MF A01

The emergence of power metal oxide semiconductor field effect transistors (power MOS) over the past few years has created a revolution in the design of mass produced circuits such as switching power supplies. Their switching speed of 20 to 50 nanoseconds in these applications is an order of magnitude improvement over bipolar types. The inherent switching speed limitations of this technology were examined and discovered that, using appropriate and reasonably simple pulse generators with switching times approaching one nanosecond. Switching speeds of 1.3 nanoseconds were obtained under lightly loaded conditions (400 volts into 50 ohms) and single device peak currents of 145 amperes were obtained in approximately five nanoseconds. DOE

N85-14708# Ames Lab., Iowa.
X-RAY ABSORPTION IN PERFECT CRYSTALS
J. D. Zimmerman 1 Aug. 1984 105 p refs
(Contract W-7405-eng-82)
(DE84-016034; IS-T-1150) Avail: NTIS HC A06/MF A01

Attenuation coefficients for germanium, silicon and HOPG were measured for the fundamental, second and third harmonic wavelengths of the tungsten L1, L(alpha)1, and L(gamma), excitation lines. The relation between the atomic scattering factor and the photoelectric contribution to the attenuation coefficient is discussed. Also, theoretical calculations of these are discussed along with theoretical calculations for the coherent and incoherent processes. Following this, the unique apparatus on which the experiment was performed along with some general experimental techniques which were used are described. This is proceeded by the results and discussion of the data obtained for the perfect crystals and HOPG. Also, experimental attenuation coefficients for HOPG are presented for different temperatures. Within the conclusions, the results of the data are summarized and differences in obtaining attenuation coefficients for the perfect crystals and HOPG are discussed. In the final chapter, recommedations are given for further studies to determine characteristics of the change of the linear attenuation coefficient in the regime of the thick crystal or small scattering angle. DOE

N85-14709# California Univ., Livermore. Lawrence Livermore Lab.
THEORETICAL METHODS FOR THE STUDY OF TRANSITION METALS IN CRYSTALS
N. W. Winter and R. M. Pitzer (Ohio State Univ., Columbus) 23 Jul. 1984 10 p refs Presented at the Conf. on Tunable Solid State Lasers, La Jolla, Calif., 13-15 Jun. 1984
(Contract W-7405-eng-48)
(DE84-015606; UCRL-91284; CONF-8406188-1) Avail: NTIS HC A02/MF A01

The characterization of the electronic structure of impurities in solids impacts a large class of phenomena and devices. It is particularly important for the systematic development of new solid state laser media. The large number of ion-host combinations that

must be studied in order to optimize the linear and non-linear optical properties and the thermal and mechanical properties of the laser precludes a case by case experimental investigation. This suggests that an aggressive theoretical effort to determine the optical properties of these materials will be useful in the search for new tunable solid state lasers. Unlike the Block states of a perfect crystal, the electronic states associated with impurities are localized on a very few atoms. Because their energy levels are usually well separated from those of the host crystal, the electronic spectroscopy of transition metal and rare earth ion impurities offers a wealth of information. The theoretical methods used to describe the properties of transition metals in crystals do not differ in principle from those used to treat atoms and molecules. DOE

N85-14710# Los Alamos Scientific Lab., N. Mex.
ACTINIDES, THE NARROWEST BANDS
J. L. Smith and P. S. Riseborough 1984 17 p refs Presented at Internatl. Conf. on Valence Fluctuations, Cologne, 27 Aug. 1984
(Contract W-7405-eng-36)
(DE84-016463; LA-UR-84-2658) Avail: NTIS HC A02/MF A01

A table of elements is shown that demonstrates the crossover from superconductivity to magnetism as well as regions of mixed valence. In particular, the actinides must eventually show 4f-electron like mixed valence, after the 5f-electrons become localized. There also seems to be an adiabatic continuation between heavy fermion and mixed valence behavior. DOE

N85-14711# Oak Ridge National Lab., Tenn.
INCLUSION OF ELECTRON TRANSFER IN THE CALCULATION OF K(n)L(v) MULTIPLE VACANCY PRODUCTION BY ION IMPACT
R. L. Becker, A. L. Ford (Texas A&M Univ., College Station), and J. F. Reading 1984 3 p refs Presented at Intern. Conf. on X-Ray and Inner-Shell Processes in Atoms, Leipzig, 20 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE84-016596; CONF-840829-1) Avail: NTIS HC A02/MF A01

Measurements of K X-ray or Auger satellite (and hypersatellite) intensities provide information on KL/sup v/ (and K(2)L/sup v/) hole production in close collisions of ions with atoms. The L shell vacancy distributions usually are nearly binomial. The binomial distribution follows immediately from a statistical model in which the creations of the various holes are regarded as mutually independent. This distribution is specified by a single parameter, p, the mean L shell vacancy probability per electron, which can depend on the speed (v), the nuclear charge(Z) and the ionic charge (q) of the projectile, and on the nuclear charge of the target. The saturation of p with Z was obtained in the first Magnus approximation and the more refined coupled channel approximation. In both schemes, a single centered expansion (SCE) in spin orbitals representing bound and unbound states of the target was used. Ten radial functions were employed for each of four angular momenta (s, p, d, and f states). DOE

N85-14712# Sandia Labs., Albuquerque, N. Mex.
EPR LINEWIDTH STUDIES OF UNPAIRED ELECTRONS AT THE Si-SiO2
K. L. Brower 1984 6 p refs Presented at Defects in Semiconductors Conf., Coronado, Calif., 12 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-016727; SAND-84-0823C; CONF-840878-2) Avail: NTIS HC A02/MF A01

Electron paramagnetic resonance studies of the dangling bonds (P sub b centers) at the (111) Si-SiO2 interface are presented. In particular the angular variation in the P sub b Zeeman resonance is dominated by Zeeman line broadening effects which could arise from strain within the silicon at the interface. The dipolar contribution to the observed linewidth is less than that expected assuming a random distribution of dangling bonds on an atomically flat (111) Si-SiO2 interface. This observation tentatively suggests that the dangling bonds are distributed with enhanced separation. Such an effect might occur if the dangling bond formation results from the release of strain energy from a localized region at the interface. Pulsed ruby laser irradiation of the Si-SiO2 interface at energies above the threshold for melting of the silicon increases the dangling-bond concentration by a factor of 10 and produces an angular variation in the observed linewidth which is consistent with planar dipolar broadening effects. DOE

N85-14713# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTRONIC AND MAGNETIC PROPERTIES OF TRANSITION-METAL SURFACES, INTERFACES AND OVERLAYERS
L. M. Falicov, R. H. Victora (IBM Watson Research Center), and J. Tersoff Aug. 1984 16 p refs Presented at 1st Intern. Conf. on the Structure of Surfaces (ICSOS), Berkeley, Calif., 13 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-016886; LBL-18209; CONF-840821-1) Avail: NTIS HC A02/MF A01

Results of calculations for the electronic and magnetic properties of transition-metal surfaces, interfaces and overlayers are presented for a variety of systems. They involve Ni, Co, Fe and Cr in a diversity of forms, including alloys, metastable configurations, and overlayers on nonmagnetic metals. The overall behavior of these systems can be interpreted in terms of four qualitative rules which are presented, analyzed, and illustrated. DOE

N85-14714# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRONIC BANDSTRUCTURE OF AN INCOMMENSURATE CRYSTAL
T. Rasing Jun. 1984 6 p refs Presented at 17th Intern. Conf. on the Phys. of Semiconductors, San Francisco, 6 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-016891; LBL-18136; CONF-84016891) Avail: NTIS HC A02/MF A01

The consequences of an incommensurate lattice modulation on the electronic energy levels were studied by optical transmission experiments on Rb2ZnBr4. The results are analyzed with a simple tight binding model and the superspace symmetry of the crystal is considered. The lattice translational symmetry of crystalline matter leads to the concepts of the Brillouin zones, Bloch electrons, phonons and the like. In a crystal where the lattice is periodically distorted with a period that is incommensurate with the underlying lattice, this translational symmetry is broken. Incommensurate crystals are perfectly ordered and are described by higher dimensional superspace groups. It is shown how this superspace approach provides a natural framework to understand the electronic bandstructure as well. DOE

N85-14715# Plessey Co. Ltd., Towcester (England).
THE DEVELOPMENT OF A 90 GHz SOLID STATE NOISE SOURCE Final Report
D. M. Brookbanks Paris ESA Jan. 1984 81 p refs
(Contract ESTEC-4675/81/NL-MS(SC))
(CD.6500695; ESA-CR(P)-1906) Avail: NTIS HC A05/MF A01

The development of 90 GHz silicon avalanche noise diodes and their incorporation into waveguide noise sources are described. These sources were characterized for the absolute value of the noise output power and the stability of this power as a function of time. A measurement system was developed to assess these noise sources. The measured stability over a 24 hr sampling period is 0.007 dB sq root Allan variance. Maximum stability is obtained for sampling intervals of 30 min when stability is 0.0025 dB sq root Allan variance. Author (ESA)

N85-14653# Joint Publications Research Service, Arlington, Va.
COHERENT AMPLIFICATION OF ULTRASONIC PULSES IN ACTIVATED CRYSTALS Abstract Only
O. P. Varnavskiy, A. N. Kirkin, A. M. Leontovich, A. M. Malikov, A. M. Mozharovskiy, and Ye. D. Trifonov *In its* USSR Rept: Phys. and Math. (JPRS-UPM-84-007) 18 Oct. 1984 p 10-11 Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (Moscow), v. 86, no. 4, Apr. 1984 p 1227-1239 Original language document announced

as A84-35504 (For primary document see N85-14651 05-70)
Avail: NTIS HC A06

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-14716 Princeton Univ., N. J.
STABILITY QUESTIONS FOR GRAVITY IN 4 AND HIGHER DIMENSIONS Ph.D. Thesis
Roberta Elizabeth Young 1984 222 p
Avail: Univ. Microfilms Order No. DA8419723

Some classical and semiclassical stability questions for gravity in four and higher dimensions are investigated. The formalism for Euclidean quantum gravity is established and results for the asymptotically flat instanton calculations are reviewed. Details of the calculations involved in considering the semiclassical stability questions for asymptotically locally flat instantons are given. Similar calculations are also given for compact instantons. Some preliminary investigations of stability questions associated with Kaluza-Klein theories are presented. Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N85-14717*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RESIDENT RESEARCH ASSOCIATESHIPS. POSTDOCTORAL AND SENIOR RESEARCH AWARDS
1984 27 p
(NASA-TM-87399; NAS 1.15:87399) Avail: NTIS HC A03/MF A01 CSCL 05I

Opportunities for research at Marshall Space Flight Center's Materials and Processes Laboratory, Space Sciences Laboratory, and Systems Dynamics Laboratory are described. Information is provided for applicants desiring designation as a research associate and a list of laboratory directors and research advisors is provided. A.R.H.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-14718 Deutsche Lufthansa Aktiengesellschaft, Frankfurt am Main (West Germany).
[ACTIVITIES REPORT OF THE AEROSPACE INDUSTRY IN WEST GERMANY] Annual Report [LUFTHANSA JAHRBUCH '84]
Hans-Joachim Allgaier, ed. 31 May 1984 313 p refs In GERMAN
(ISSN-0176-5086) Copyright. Avail: Issuing Activity

The development of the Deutsche Lufthansa AG between June 1983 and May 1984 is discussed. Passenger aircraft, costs, rates and regulation in civil aviation are presented. The structure of the Lufthansa group and participations are described. Lufthansa branches, training institutes and passenger operations are discussed. Author (ESA)

N85-14719# ALPHATECH, Inc., Burlington, Mass.
A FRAMEWORK FOR RESEARCH ON ADAPTIVE DECISION AIDS Final Report, 1 Nov. 1982 - 31 Oct. 1983
William B. Rouse and Sandra Rouse, H. Wright-Patterson AFB, Ohio Aerospace Medical Research Lab. Oct. 1983 70 p Prepared in cooperation with Search Technology, Inc., Norcross, Ga.
(Contract F33615-82-C-0509; AF Proj. 6893)
(AD-A138331; AFAMRL-TR-83-082) Avail: NTIS HC A04/MF A01 CSCL 05/1

A review of the literature on decision aids is presented, with particular emphasis on aids that adapt to situations and/or users. A framework for design of adaptive decision aids is proposed and used to identify design issues associated with aids for command and control. This framework is also used as a basis for defining several important research issues that should be addressed if adaptive aiding technology is to progress. Author (GRA)

N85-14720# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
[ACTIVITIES REPORT IN EARTH AND PLANETARY ENVIRONMENTS PHYSICS] Annual Report, 1983 [RAPPORT D'ACTIVITE CRPE POUR L'ANNEE 1983]
Jul. 1984 67 p refs In FRENCH
(CRPE-NT-134) Avail: NTIS HC A04/MF A01

Ion media electrodynamics; natural plasma waves; low and middle atmosphere; electromagnetic communication and propagation theory; and space terrestrial instrumentation and data treatment were studied. The results obtained by the processing of data from Geos, ISEE and Arcad satellites and from the Eiscat radar are discussed. The activities in the field of natural plasmas include the Sherpa coherent radar for the study of ionospheric irregularities. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-14721 Drexel Univ., Philadelphia, Pa.
SOME ATTRIBUTES OF ONLINE SEARCH INTERMEDIARIES THAT RELATE TO SEARCH OUTCOME Ph.D. Thesis
Trudi Bellardo 1984 161 p
Avail: Univ. Microfilms Order No. DA8415621

The purpose of the study was to investigate some personal attributes of online search intermediaries that were believed to affect the quality of their search results. Sixty-one subjects were selected from the online searching courses in six graduate programs in library and information science. The degree of proficiency of the subjects at the end of their DIALOG training was measured by their performance on two questions that they searched in the ERIC ONTAP data base. Their creativity level was measured using two self report inventories, their intelligence level was approximated from their GRE Quantitative and Verbal scores, and their personality traits in regard to masculinity, femininity, and self esteem were assessed and measured using the interpersonal Disposition Inventory. Factor analysis was used to reduce the large number of independent variables to four clusters, called Attributes. The study findings suggest that the differences in performance among individuals with the same level of experience and type of training can be attributed, to a small degree only, to their general verbal and quantitative aptitude, their artistic creativity, and to their inclination toward critical and analytical creative thinking. Dissert. Abstr.

N85-14722 Carnegie-Mellon Univ., Pittsburgh, Pa.
OPTIMAL QUERY PROCESSING IN DISTRIBUTED DATA BASE MANAGEMENT SYSTEMS WITH DATA REDUNDANCY
Marc I. Kellner 1984 145 p
Avail: Univ. Microfilms Order No. DA8418328

The impact of data redundancy on optimal query processing in a relational distributed data base management system is

investigated. The optimal processing of a special class of queries, called simple queries, is examined, with redundant copies of various relations available in the DDBMS. It is shown that for this class of queries, and for a broad range of DDBMS structures, it is possible to efficiently determine which copies of redundant relations are utilized in an optimal schedule which responds to a given query. The generalization of these simple query results to broader classes of queries is investigated next. It is proven that two of the major simple query results actually generalize to hold for all queries. An operational query processing heuristic is modified to enable it to efficiently deal with redundancy. The modified heuristic incorporates the procedure developed earlier to eliminate unneeded copies of redundant relations. Dissert. Abstr.

N85-14723 Cincinnati Univ., Ohio.
INTERPRETATION OF NATURAL LANGUAGE DATABASE QUERIES USING OPTIMIZATION METHODS
William Ernest Leigh 1984 279 p
Avail: Univ. Microfilms Order No. DA8420891

The potential of optimization techniques to interpret natural language, database queries is examined. The proposed method involves developing a 0-1 integer programming problem for each query. The possible values that the set of variables in the optimization they take on is an enumeration of possible such individual associations between the database schema and the query. The solution to the integer programming problem corresponds to a single assignment of database data items and relationships to the words in the query. Constraints are derived from syntactic and database schema knowledge stored as libraries of templates. An objective function is used to rank the possible associations as to their likelihood of agreement with the intent of the questioner. A test mechanism was built to support evaluation of the proposed method. Suitable knowledge source template sets and an objective function were developed experimentally with the test mechanism from a learning sample of queries. Then the performance of the method was compared to that of an established system. Dissert. Abstr.

N85-14724 California Inst. of Tech., Pasadena.
HETEROGENEOUS DATA BASE ACCESS Ph.D. Thesis
Alexandros Vhristou Papachristidis 1984 114 p
Avail: Univ. Microfilms Order No. DA8420825

A design for accessing commercially available data bases and other data base systems from a given, local data base system is presented. Using this design, data from the local data base and from one or more foreign data bases is integrated in framing the response to a single query. The design does not presume any standardization or integration of any kind on the part of a target data base. An expert system was designed, to be used by the applications programmer, for acquiring the information about a target data base, the communication path with the target computer, and the protocol for sending a data retrieval request. It also obtains from the applications programmer the nature of the data to be accessed and instructions for converting the oncoming data into the local system's own format. State-of-the-art techniques used for interfacing heterogeneous data bases and natural language front-ends to data base systems are examined. Dissert. Abstr.

N85-14725 New York Univ., New York.
A SELF-ORGANIZING DATABASE SYSTEM: A DIFFERENT APPROACH TO QUERY OPTIMIZATION Ph.D. Thesis
Gregory Ilya Piatetsky-Shapiro 1984 108 p
Avail: Univ. Microfilms Order No. DA8421550

A Self Organizing Database System (SODS) monitors queries asked, finds a good (or optimal) database structure for those queries, and suggests or does the reorganization. A prototype SODS for single file relational queries is described and an integrated analysis of its major design problems is given. They are: (1) estimation of the number of records satisfying a condition (i.e., condition selectivity); (2) query optimization; (3) storing information about a set of queries; (4) optimal selection of secondary indices. Results for each of those problems are presented. Some of this research was implemented in FASTSCAN, a commercial query system. Elementary operations (such as UNION, INTERSECT) on pointer and record streams are presented. Use of the query parse tree to construct a query evaluation method (EM) from those operation is shown. An algorithm for selecting the optimal EM, based on converting the query to conjunctive normal form is given. Dissert. Abstr.

N85-14726# Committee on Science and Technology (U. S. House).
THE AVAILABILITY OF JAPANESE SCIENTIFIC AND TECHNICAL INFORMATION IN THE UNITED STATES
Washington GPO 1984 411 p refs Hearings before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 98th Congr., 2d Sess., no. 95, 6-7 Mar. 1984
(GPO-35-241) Avail: Subcommittee on Science, Research and Technology

The level of awareness in this country about Japanese scientific and technical information must be raised and appropriate actions must be identified for assuring the acquisition, translation, and utilization of this information. The role the government should play, costs, possible markets in the United States, and translation efforts now being made are examined. A.R.H.

N85-14727# Oak Ridge National Lab., Tenn. Chemical Technology Div.
INTEGRATED DATA BASE PROGRAM: A STATUS REPORT
K. J. Notz and J. A. Klein Jun. 1984 26 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013604; ORNL/TM-9139) Avail: NTIS HC A03/MF A01

The Integrated Data Base (IDB) Program provides official Department of Energy (DOE) data on spent fuel and radioactive waste inventories, projections, and characteristics. The accomplishments of FY 1983 are summarized for three broad areas: (1) upgrading and issuing of the annual report on spent fuel and radioactive waste inventories, projections, and characteristics, including ORIGEN2 applications and a quality assurance plan; (2) creation of a summary data file in user friendly format for use on a personal computer and enhancing user access to program data; and (3) optimizing and documentation of the data handling methodology used by the IDB Program and providing direct support to other DOE programs and sites in data handling. Plans for future work in these three areas are outlined. DOE

N85-14728# ALPHATECH, Inc., Burlington, Mass.
INFORMATION FLOW IN EVENT-DRIVEN LARGE-SCALE SYSTEMS Executive Summary
Mar. 1984 29 p refs
(Contract DE-AC01-80RA-50418)
(DE84-014167; DOE/RA-51418/1) Avail: NTIS HC A03/MF A01

Issues of real time communication and coordination of distributed estimation and control agents were focused on and the class of event driven stochastic systems was investigated. These are hybrid state dynamical systems, whose state description consists of a control and operation related to emergency control, stability analysis, restorative control and security assessment. The study of event-driven systems represented an important area for basic research in the design of distributed estimation and control algorithms for power systems operation. The design and performance of different organizational structures, with variations in information aggregation strategies, event directed communications and event directed distributed control are examined. DOE

N85-14729# California Univ., Berkeley. Lawrence Berkeley Lab.
LOWER LEVEL INFERENCE CONTROL IN STATISTICAL DATABASE SYSTEMS
David L. Lipton and Harry K. T. Wong (San Francisco State Univ., Calif.) May 1984 23 p refs Presented at the 2nd IFIP Intern. Conf. on Computer Security, Toronto, Ontario
(Contract DE-AC03-76SF-00098)
(DE84-016005; LBL-17413-Rev; CONF-840952-1-Rev) Avail: NTIS HC A02/MF A01

An inference which is the process of transforming unclassified data values into confidential information was studied. Statistical

aggregates to deduce individual data values were used, however, other types of inference are possible. Obscure correlations is possible from an expert knowledge of the population. Inferences may be formed from obvious facts about the world. Expert users of a database management system may infer data values from variables in the system performance. As a countermeasure, system management considers these variable and correlations while formulating system security policy. DOE

N85-14730# Oak Ridge Y-12 Plant, Tenn.
ROLE OF DESIGNMANAGER IN INFORMATION ENGINEERING
T. L. Futrell 1984 31 p refs
(Contract DE-AC05-84OS-21400)
(DE84-016807; Y/CP-27) Avail: NTIS HC A03/MF A01

The increased complexity of manufacturing operations and the resulting tremendous increase in data profileration is outlined. Increased manufacturing overheads are a measure of the failure to deal successfully with data proliferation. Commercial enterprises have successfully employed computer technology for years, the massive application of this technology to the management of data in the manufacturing environment lags far behind. The Oak Ridge Y-12 Plant which is a large manufacturing facility is faced with many of these problems. Efforts to apply currently available tools, such as DESIGNMANAGER, and information engineering methods to the tremendous task of data management are described. DOE

N85-14236# Centre National d'Etudes Spatiales, Toulouse (France). SPOT Image Center.
THE SPOT DATA BANK SYSTEM
J. P. Marc and J. P. LeGorgeu *In* ESA EARSeL/ESA Symp. on Integrative Approaches in Remote Sensing Aug. 1984 p 281-286
(For primary document see N85-14202 05-43)
Avail: NTIS HC A17/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N85-14731# Oak Ridge Gaseous Diffusion Plant, Tenn.
METHODOLOGY FOR ECONOMIC EVALUATION OF PROCESS TECHNOLOGIES IN THE EARLY RESEARCH AND DEVELOPMENT STAGES
K. A. Williams 1 Aug. 1984 500 p refs
(Contract DE-AC05-84CT-21400)
(DE84-015863; K/OA-5684) Avail: NTIS HC A21/MF A01

A systematic methodology for building, combining, and exercising a set of specially devised performance, design, and cost models in a form suitable for process economic assessments in the presence of major technological uncertainties was developed. The development and utilization of the new methodology are described. A cohesive spectrum or distribution of the resulting performance and cost figure of merit values, along with their associated probabilities, is calculated. The appropriate format for development of the user's modeling system, which includes the capability to reoptimize the proposed process for each set of process inputs considered and the required stepwise approach for selection of values and ranges of the major uncertain process variables of inputs are presented. The basic principles of this combined methodology are applied to many new processes or technologies - particularly those in their early R and D stages. Interpretation of the probabilistic output data is also discussed. Experiences with this methodology in the assessment of advanced uranium isotope separation processes and in assessment of a photochemical syngas cleanup system concludes that: disappointments in process performance related areas rather than hardware cost issues tend to have the most deleterious effects on unit cost, and the process proponent's earliest single point best guess unit cost estimates usually fall in the most optimistic fringes of the computed uncertainty ranges. DOE

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

No abstracts in this category.

88 SPACE SCIENCES (GENERAL)

N85-14732# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
FIFTH CONFERENCE ON STAR CLUSTERS AND ASSOCIATIONS AND THEIR RELATION TO THE EVOLUTION OF THE GALAXY
J. Ruprecht, ed. and J. Palous, ed. 1983 315 p refs In ENGLISH and RUSSIAN Conf. held in Prague, 27 Sep. - 1 Oct. 1983; sponsored by the Committee of Multilateral Cooperation of the Academies of Sciences of the Socialist Countries, Subcommission No. 6
(Publ-56) Avail: NTIS HC A14/MF A01

Open clusters, globular cluster, stellar associations and moving groups, and local kinematics and galactic structure were discussed. For individual titles, see N85-14733 through N85-14766.

N85-14733# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
STRUCTURAL PROPERTIES OF OPEN STAR CLUSTERS AND THEIR RELATION TO THE GALAXY **c90**
J. Ruprecht *In its* Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evaluation of the Galaxy 1983 p 2-12 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Structural peculiarities of most open star clusters were studied. Star clusters could indicate dynamical influence and disruption of clusters. The distribution of the number of disturbed clusters relatively to the total number of clusters seems to suggest some connection with the distribution of the interstellar matter in the sky. Author

N85-14734# Lund Observatory (Sweden).
OPEN STAR CLUSTERS AND THE EVOLUTION OF THE GALACTIC DISK **c90**
Goesta Lynga *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 13-27 (see also p. 292) refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Open star clusters are in many respects the best objects to observe for the study of the structure and evolution of the galactic

disk. Distances, ages and element abundances can all be relatively well determined for these objects. Relevant data are discussed and different conclusions regarding abundance and age gradients in the disk are examined. These disk properties will be related to existing models for the galactic evolution. Author

N85-14735# Urals A. M. Gorky State Univ., Sverdlovsk (USSR). Dept. of Astronomy and Geodesy.
ON THE SCALE OF DISTANCES OF THE GALAXY **c90**
K. A. Barkhatova and O. P. Pylskaya *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 14-27 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The distribution of open clusters in the Galaxy plane was studied taking advantage of recent data. Clusters have a tendency to be localized in Galactic longitudes 120 to 300 deg. which coincides with the direction of the magellic clouds and magellanic stream. Two age peculiarities of the spatial distribution of open cluster are given. The dependence of linear diameters in their distances from the Galaxy center is discussed. A supposition is made about the necessity to correct parameters of the zero-age main sequence for objects of early spectral class and of interstellar absorption. Author

N85-14736# Lausanne Univ. (Switzerland). Inst. d'Astronomie.
AGE GROUPS AND COMPOSITE DIAGRAMS FOR YOUNG OPEN CLUSTERS **c90**
J.-C. Mermilliod *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 28-36 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Stellar evolution for intermediate mass stars and stellar content of young open clusters are discussed within the framework of the age group concept. The composite color-magnitude diagrams for 14 age groups, including a total of 75 clusters, form the basis of these investigations. Preliminary results are given of an extensive radial velocities observing program of red giants and dwarfs in open clusters, aimed at the determination of membership and binarity as well as orbital elements. Results of a study of the distribution of the projected rotational velocities of red dwarfs in nearby open clusters are also presented. Author

N85-14737# Konkoly Observatory, Budapest (Hungary).
THE GALACTIC DISTRIBUTION OF OPEN CLUSTERS OF DIFFERENT AGES AND THE ANGULAR VELOCITY OF THE SPIRAL STRUCTURE **c90**
B. A. Balazs and Goesta Lynga (Lund Observatory) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 37-48 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Results based on the galactic distribution of open clusters of various ages are presented. On the basis of this distribution the shape and angular velocity of the spiral pattern is discussed. The results suggest: (1) scaling down our whole Galaxy, accepting solar radius = 7kpc as the galactocentric distance of the Sun; (2) the angular speed of the pattern lies somewhere between 33 and 36 km/s/kpc (or between 23 and 25 if solar radius = 10 kpc); accordingly the location of the Sun is close to the so called co-rotation circle and, therefore, the galactic position of our solar system is an exclusive one; and (3) the spiral pattern seems to be compatible with long density waves, consequently the source of the wave energy should apparently be looked for in the central regions of the Galaxy. Author

N85-14738# Sternwarte der Deutschen Akademie der Wissenschaften, Sonneberg (East Germany). Zentralinst. fuer Astrophysik.
THE BEHAVIOUR OF BRIGHTER BINARIES AND YELLOW GIANTS IN OPEN CLUSTERS **c90**
W. Goetz *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 49-59 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The behavior of groups of massive stars in open clusters is examined. The high concentration of binaries and yellow giants toward the center of the open cluster NGC 2632 (Praesepe) is not a singular phenomenon. It can be found in the Hyades and in the Coma-Berenices cluster, which are nearly of equal age, but not in younger and older objects. This phenomenon depending on the mean mass of a star group, its evolutionary phase, the mean age of the cluster and the time of star formation within it, can be explained by the diagram of the evolution of star clusters, i.e., by cosmogonic reasons. It is not caused by gravitational effects. Author

N85-14739# Academy of Sciences of the Ukrainian SSR, Kiev (USSR).
ON COLLECTIVE EFFECTS IN THE ROTATION OF STARS IN CLUSTERS AND ASSOCIATIONS **c90**
B. E. Zhilyaev and S. V. Marchenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 60-65 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The intrinsic rotation of stars of the galactic field and stars in clusters and associations was investigated. Fourteen star clusters and associations were selected for study. The speed of rotation of star clusters and associations was compared based on nonparametric rank criteria for the verification of statistical hypotheses. The findings indicate a statistically significant difference in the distribution functions of rotatory speeds of stars in clusters and stars of the galactic field. All stars of the galactic field in the spectral interval BO V-GO V have a unimodal function of distribution of rotatory speed, whereas stars in clusters often have a bimodal distribution of rotatory speed in the spectral interval B8 V-AO V. Findings concerning specific star clusters in the spectral interval F4 V-GO V are discussed. Transl. by B.G.

N85-14740# Academy of Sciences, Potsdam (East Germany). Zentralinst. fuer Astrophysik.
A SEARCH FOR POSSIBLE MEMBERS OF OPEN CLUSTERS AMONG KNOWN Ap STARS **c89**
E. Zelwanowa and M. Popova (Bulgarian Academy of Sciences, Sofia) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 66-68 (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

So far the search for and the investigation of Ap stars in open clusters was carried out mainly in cluster cores. But the clusters have coronae extending to some radii of their core and containing up to 50% of the members of the cluster. Therefore, some of the known Ap stars, which seem to be field stars, may in fact be cluster members. To find such stars, a comparison of the Ap star catalog of JASCHEK and EGRET containing more than 2000 Ap stars, and the star cluster catalog of ALTER, FUPRECHT and VANYSEK was made. Author

N85-14741# Budapest Science Univ. (Hungary). Dept. of Astronomy.
THE PRESENT STATE OF THE INTERNATIONAL STAR CLUSTER PHOTOMETRY PROGRAMME **c89**
G. Szecsenyi-Nagy *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 69-79 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Detailed astrometric, photometric and spectroscopic investigation of open star clusters were collected. Hungarian scientists were expected to carry out the multicolor photometry of cluster member stars (at least to a certain extent). Considering that the majority of the program stars are far too dim to be measured by

the moderate-sized photoelectric telescopes and individual photoelectric photometry of cluster members would be extremely time-consuming, photographic UBV photometry was chosen as the most advantageous solution. More than 200 plates were collected in these spectral bands. A short review is presented on the observations in order to inform the cooperating partners. At the same time, a proposal is made with a view to supplementing the list of jointly studied open clusters and information is requested from our collaborators on the cluster membership probabilities and spectra of stars in order to take the preliminary steps in laboratory measurements. Author

N85-14742# Lund Observatory (Sweden).
THE LUND CATALOGUE OF OPEN CLUSTER PARAMETERS c89
Goesta Lynga *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 80-88 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

This catalogue is computer-based and issued in collaboration with the CDS in Strasbourg. The outlay of the catalogue will be described, particularly the tracer system for data base handling. A new examination of cluster appearances on survey charts has been entered in the 1983 edition. Various parameters will be compared and their accuracy discussed. Author

N85-14743# Academy of Sciences (USSR), Moscow. Astronomical Council.
COLLECTIVE PROCESSES AND FORMATION OF STAR CLUSTERS c90
V. L. Polyachenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 89-102 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The stability problem for spherical collisionless systems with different degrees of star distribution anisotropy in velocity space is solved. It is shown that the development of an instability in systems of stars with highly eccentric orbits may lead to a distinct elliptical deformation. Author

N85-14744# Polish Academy of Sciences, Warsaw. Astronomical Center.
BINARIES AND EVOLUTION OF GLOBULAR CLUSTERS c90
J. S. Stodolkiewicz *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 103-114 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The influence of binaries on the evolution of globular clusters is studied numerically using the Monte Carlo method. It is assumed that initially the stellar systems are composed of single stars only and binaries are born /as a result of three-body encounters/ during the evolution of the clusters. The life of each hard binary in the cluster is studied individually. It is shown that the first binaries appear long before core collapse is completed, and then a population of a few hard binaries remains in the cluster during its whole life. Practically all energetic binary-single star interactions take place in the deep, internal parts of the core, populated mostly by the heaviest stars of the cluster. The binary-single star interactions become a source of energy which stops the collapse of the core and causes expansion and gradual disintegration of the whole cluster during the post-collapse phase. Author

N85-14745# Ceskoslovenska Akademie Ved, Prague.
EVOLUTION OF GLOBULAR CLUSTERS Abstract Only c90
In its Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 115-116 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The results of a series of studies analyzing spatial distribution and the movement of clusters in the Galaxy are reported. The effect of dynamic friction influences the movement of massive clusters found in the central section of the Galaxy. As a result, these clusters lose energy and sink to the galactic center. Dynamic friction together with the effect of dissipation and tidal destruction lead to complete disappearance of clusters whose orbits originally were located in the central part of the Galaxy. The implications for the formation of new spherical clusters are discussed.
Transl. by B.G.

N85-14746# Sternberg Astronomical Inst., Moscow (USSR).
EVOLUTION OF GLOBULAR CLUSTERS Abstract Only c90
V. G. Surdin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 117-118 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

In principle the dimensions and masses of globular clusters, their chemical composition, the distribution and character of the motions in the Galaxy contain considerable information on the conditions in which the clusters originated. However, in order to compare the observed characteristics of clusters with the conclusions of cosmogenic theories, it is important to establish to what extent the system of globular clusters has evolved dynamically from the time of its origin. It is necessary to determine the region in the Galaxy and in the cluster mass spectrum (or in other characteristics) in which the effect of the dynamic evolution was minimal. The relation between the degree of concentration and mass of the cluster as well as the jump in the luminosity function is explained. A scenario of evolution of protoglobular clusters, originating from gaseous fragments with masses has been developed. B.W.

N85-14747# Main Astronomical Observatory, Pulkovo (USSR).
INVESTIGATION OF CENTRAL PARTS OF GLOBULAR CLUSTERS, PERFORMED IN PULKOVO c89
Z. I. Kadla and A. N. Gerashchenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 119-140 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

As part of an ongoing research project being conducted at the Main Astronomical Observatory of the U.S.S.R. Academy of Sciences in Pulkovo, theoretical models of the central parts of globular clusters have been constructed. Much of the material providing information on the position of stars for several clusters was obtained at the end of the nineteenth and the beginning of the twentieth century. With the use of some of these data, color-magnitude diagrams have been composed for stars of the globular clusters NGC 6205 and 5272 at various distances from the center of each cluster. Stars in these clusters with variable and constant amplitude have been compared, and histograms have been constructed to depict stellar distribution. Transl. by B.G.

N85-14748# Sternberg Astronomical Inst., Moscow (USSR).
BRIGHTNESS DISTRIBUTION IN GLOBULAR CLUSTERS DERIVED BY THE NARROW-SLIT SCANNING METHOD c89
A. V. Mironov and E. V. Naumova (Leningrad State Univ.) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 141-144 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Preliminary results of observations of 11 globular clusters made with the aid of a narrow long slit are presented. The photometric profiles were recorded directly in the operational store of a computer with the telescope stopped in its motion about the polar axis. The photometric profiles obtained were compared with King's models and with the generalized isochrone model. The finite length and width of the slit were considered. The theoretical brightness distribution agrees well with observations in the central regions of the clusters at R approx. $< 3' - 5'$. The radii of cores R sub c and the effective radii R sub e were determined. Large-scale fluctuations of the abundant galactic background, were observed in clusters M12, M13 and NGC 6712. Author

N85-14749# Observatorium Hoher List, Bonn (West Germany).
LESSONS FROM THE GLOBULAR CLUSTER NGC 5466 c90
P. Brosche, M. Geffert, and S. Ninkovic (Astronomska Opservatorija, Belgrade) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 145-155 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

NGC 5466 is a loose globular cluster (large core radius) with low metallicity. Its absolute velocity has been measured and leads to perigalactic distances around 6 kpc. The value of the observed tidal radius is clearly too large in comparison with the theoretical value. Author

N85-14750# Sternberg Astronomical Inst., Moscow (USSR).
GALACTIC ORBITS OF GLOBULAR CLUSTERS c90
A. S. Rastorguev and V. G. Surdin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 156-160 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The nature of globular clusters is explained in relation to their galactic orbits. Direct computation of most cluster orbits seems to be impossible because of the extremely low accuracy of their proper motions. Some indirect methods have been developed to determine the shapes and sizes of the orbits. Many galactic globulars with highly eccentric orbits have been found by analyzing their velocities and galactic positions. King (1962) suspected the galactic tidal field of being responsible for the limitation of the cluster radius. A simple formula is derived relating the perigalactic distance of a cluster, the tidal radius, the cluster mass, and the galactic mass, contained in a sphere of radius. Some conclusions are drawn about the peculiar velocities of photoclusters in the early galaxy from this study. B.W.

N85-14751# Sternberg Astronomical Inst., Moscow (USSR).
THE FATE OF GLOBULAR CLUSTERS c90
V. G. Surdin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 161-166 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The evolution of globular clusters under dissipation and dynamical friction is considered. It is shown that a gravothermal catastrophe in the cluster core appears before the cluster will be completely destroyed under dissipation, or will fall into the Galactic center under dynamical friction. The objects which are formed in the cluster-core contraction process /massive black holes or close binaries/ also fall into the center of the Galaxy, or populate its bulge. Author

N85-14752# Max-Planck-Inst. fuer Astrophysik, Munich (West Germany).
THE DYNAMICAL EVOLUTION OF THE ENVIRONMENT OF AN OB ASSOCIATION c90
Guillermo Tenorio-Tagle *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 168-187 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The physical conditions of a large variety of structures, such as giant H2 regions, holes, shells and rings, present in the interstellar medium are reviewed. Such structures are thought to result from the energy input from OB associations in the form of ionizing radiation, strong stellar winds and supernova explosions. The study of the effects produced by every single one of the energy sources is proposed here as the way to evaluate, understand, and relate the observed structures with a given energy input. In particular, predictions from the study of the H2 region evolution around a stellar association are reviewed. Such an evolution accounts for the aging of the exciting stars. The resultant effects are then compared with the large (expanding and static) shells observed in our galaxy, and with alternative theoretical models. A sequence of events, based on the observed properties and the theoretical models, is proposed here as a likely scenario for the evolution of the environment of an OB association. B.W.

N85-14753# Main Astronomical Observatory, Kiev (USSR).
THE DISTRIBUTION OF DUST IN THE REGION OF THE ROSETTE NEBULA AND MON OB2 ASSOCIATION c90
N. G. Guseva *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 188-199 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The distribution of dust in the stellar region occupied by the MON OB2 association was investigated, and an attempt was made to determine the density of the dust within the boundaries of the cluster. The target region occupies a circle with a diameter of approximately 5 degrees and with its center in the young dispersed stellar cluster NGC 2244. This cluster represents the center of the MON OB2 association. The distribution of the surface density of stars was plotted relative to the distance from the center of the cluster, and the clarity of emitted dust was measured. An absence of dust was found within the boundaries of the eastern portion of the Rosette Nebula. Transl. by B.G.

N85-14754# Byurakan Observatory (USSR).
NON-STABLE MOTIONS AND INSTABILITY IN STELLAR ASSOCIATIONS c90
L. V. Mirzoyan *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 200-211 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The discovery of stellar associations and the nonstationary phenomena in these systems are discussed. It is shown that the proper motions when determined accurately and the radial velocities of stars in the associations indicate the expansion and subsequent disintegration of stellar associations. Results concerning multiple system of the Trapezium type, which are encountered nearly exclusively in associations, in the form of their cores, are discussed. Statistical analysis and investigations on the dynamical evolution by a computer evidence of the dynamic instability of these systems are presented. E.A.K.

N85-14755# Main Astronomical Observatory, Kiev (USSR).
PROPER MOTIONS AND KINEMATICAL PROPERTIES OF ORION TRAPEZIUM TYPE STELLAR SYSTEMS c90
A. I. Yatsenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 212-217 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The movements and kinematic properties of Orion Trapezium type stellar systems were calculated. Three information catalogs were consulted and compared. Dispersion of internal relative speeds was calculated for 18 stars of the Trapezium. The kinematics of Orion Trapezium type stellar-systems did not differ from that of B1 and B2 spectral type single stars. Dispersion of the internal relative speeds for stars of the Trapezium was approximately 2.5 times less than general dispersion of the speeds of B-stars. Dispersion of the internal spatial speeds of Trapezium components was about plus or minus 5 km/sec. E.A.K.

N85-14756# Budapest Science Univ. (Hungary). Dept. of Astronomy.
ON THE MOST PROBABLE NUMBER OF FLARE STARS IN THE PLEIADES FIELD c89
G. Szecsenyi-Nagy *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 218-231 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The problematic points of the observations of flare stars of

nearby open clusters and star associations were evaluated. Statistical results of flare star observations in the Pleiades field made during the past two decades are summarized. It is shown that the estimated number of flare stars in the region is too low. A model of the flare star system of the field is presented. It is composed of seven differently populated subsystems with various mean flare frequencies. It is estimated that the total number of flare stars in the Pleiades field is higher than 2500, the expected number of flare up observations to discover all of them is given. E.A.K.

N85-14757# Karlova Univ., Prague (Czechoslovakia). Dept. of Astronomy and Astrophysics.
HYADES MOVING GROUP c90
J. Bubenicek and J. Palous (Astronomical Inst.) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 232-239 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The motion of A stars from a new catalogue of space velocity vectors was analyzed. Stars moving almost parallely to the Hyades open star cluster, members of Eggen's Hyades moving group were rediscovered. The proper motions of A stars were investigated using the convergent point method. The list of A star moving group members was compiled. The shape and age distribution of this stellar group are discussed. E.A.K.

N85-14758# Ceskoslovenska Akademie Ved, Ondrejov.
THE EVOLUTION OF A SPARSE STELLAR SYSTEM Abstract Only c90
P. Hadrava *In its* Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 248 In ENGLISH and RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

A numerical simulation of a stellar system evolution is presented. The system moving in external galactic potential is supposed to be sufficiently sparse for its self gravitation and binary collisions of stars to be negligible. The numerical method enables calculation of ellipsoids of spatial and velocity distributions and velocity gradients of the system. The result analyzed for a circular orbit show a quasiperiodic focusing of stars accompanied by a great increase of spatial density. E.A.K.

N85-14759# Karlova Univ., Prague (Czechoslovakia). Dept. of Astronomy and Astrophysics.
THE FRAGMENTATION OF MOLECULAR CLOUDS AND THE IMF Abstract Only c90
V. Vanysek *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 241 In ENGLISH and RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

Stars are formed by the fragmentation of massive dense molecular clouds, and the frequency distribution of masses of the stars, the initial mass function (MF) is related to the distribution of cloud masses. However, the resulting stellar mass spectrum is sensitive to the density distribution in a molecular complex. The observed distribution of cloud masses and IMF for clusters are compared with the fast and slow models of a collapsing cloud. E.A.K.

N85-14760# Academy of Sciences (USSR), Moscow. Astronomical Council.
THE INFLUENCE OF STELLAR LUMINOSITY AND TEMPERATURE CALIBRATION ON THE DETERMINATION OF THE INITIAL MASS FUNCTION c89
V. I. Myakutin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 242-252 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The effect of stellar brightness and temperature calibration on calculation of the initial mass function was studied. Data luminosity and effective temperature for each star were calculated. Only B star associations were investigated. The geometric similarity of the theoretical evolutionary track of stars of different masses facilitated the of determination star mass and age. It is found that the different classification systems lead to differences in initial mass function. E.A.K.

N85-14761# Main Astronomical Observatory, Kiev (USSR).
ON THE CONTENT OF NITROGEN IN ATMOSPHERES OF LATE GIANTS DERIVED FROM MOLECULAR BANDS ON NH IN THE UV SPECTRAL RANGE c89
A. Shavrina *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxyy 1983 p 253-254 refs In RUSSIAN (For primary document see N85-14732 05-90)
Avail: NTIS HC A14/MF A01

The content of nitrogen in atmospheres of late giants was determined. The molecular spectrum of the NH band was analyzed. Mathematical calculations and programs employed to calculate molecular equilibrium in model atmospheres and the coefficient of continuous absorption are described. E.A.K.

N85-14762# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
THE VELOCITY-AGE RELATION FOR B AND A STARS Abstract Only c89
J. Palous and A. E. Piskunov (Academy of Sciences, Moscow) *In its* Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 256-257 In ENGLISH and RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The mean velocity and velocity dispersion age relation for B and A stars younger than 10 to the 9th power was investigated. Significant differences were found between the motion of stars younger than 5 to the 7th power years and moderately old stars. No significant growth in the velocity dispersion was found for A stars in the age interval of 2 to the 8th power to 10 years. The constancy of the velocity dispersion components in the age interval disproves Wielen's velocity dispersion age relation at about the 2 sigma significance level. The differences in the shape of the residual velocity ellipsoid for young and moderately old stars confirm the earlier conclusion that the relaxation time in the solar vicinity is close to 2 to the 8th power years. E.A.K.

N85-14763# Volgograd State Univ. (USSR).
STABILITY OF STELLAR DISK AND RATIO OF HALO TO DISK MASSES IN THE GALAXY c89
A. G. Morozov *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 258-261 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

To stabilize locally the stellar gravitating disk, it is necessary to satisfy Toomre's condition. C sub r > or = c sub T = 3.36 G sigma alef where c sub r is the dispersion of stellar radial velocities, sigma, is the surface density of the disk and alef is the epicyclic frequency. Toomre assumed that the stellar disk was at the stability limit (c sub r > = c sub T). But the numerical experiments of Miller show that the stellar disk can only be stationary if c sub r > or = c sub T (except for the central part of the disk). It is concluded that the only model which is stable to nonaxisymmetric perturbations is the Caldwell and Ostriker model. E.A.K.

N85-14764# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
EXCITATION OF SPIRAL PATTERNS IN RESPONSIBLE DENSITY WAVE THEORY c89
K. O. Thielheim *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 262-279 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The generation of spiral patterns in the responsive density wave theory is discussed. The density wave theory is based on a conjecture of symmetry breaking in the equations of motion of stellar orbits in differentially rotating stellar disks by an oval perturbation growing with time. Analytical approaches based on first order epicyclic approximation and computer experiments are performed to investigate the consequences of this working hypothesis. E.A.K.

N85-14765# Stockholm School of Economics (Sweden).
LOCAL GALACTIC KINEMATICS **c90**
P. O. Lindblad, T. Westin, N. Zentelis, and K. Loden *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 280-286 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The nearby brighter stars which form a separate local subsystem in the Milky Way are discussed. The inclination of this subsystem to the galactic plane manifests itself in the Gould's Belt. The expansion and peculiar velocity gradients of this system was demonstrated. The extension in space, age and kinematics of the Gould Belt system were investigated to obtain sufficient age resolution for stars younger than 10 to the 8th power, one is restricted to stars earlier than AO. Proper motions in the FK4 system are available for a majority of these stars. The photometry and radial velocity studies were extended to larger distances in four galactic longitudes selected to provide maximum information about expansion ages. Distances and ages were derived from the photometry. E.A.K.

N85-14766# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
KINEMATICS OF B AND A STARS **c90**
J. Palous *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 287-291 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

The A, B, C and K were estimated in the solar vicinity from the gradients of U, V linear velocity components in the X, Y plane. We found differences between the very young /age 5 to the 7th power years/ and moderately old /age > 2 to the 8th power years/ stars. The noncircular motions of the very young stars are interpreted on the result of the expansion of the local system. E.A.K.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-14767 Johns Hopkins Univ., Baltimore, Md.
X-RAY AND ULTRAVIOLET OBSERVATIONS OF BL LACERTAE OBJECTS Ph.D. Thesis
Claudia Megan Urry 1984 365 p
Avail: Univ. Microfilms Order No. DA8421235

Five X-ray bright BL Lacertae objects, PKS 0548.322, Mrk 421, 1218+304, Mrk 501, and PKS2155-304, have been studied with X-ray and ultraviolet spectroscopic detectors on three satellites. The data include HEAO-1 A2 observations of PKS 2155-304; HEAO-2 SSS observations of all five objects, and IUE observations of PKS 0548-322 and PKS 2155-304. Analysis of these data indicates six principal results. First, with one exception, all spectra are well fit by single component power lay models. Second, the X-ray and ultraviolet spectra are characterized by a lack of strong emission or absorption features. Third, the ultraviolet and X-ray spectra appear to be smoothly connected, implying the existence of a common emission mechanism. Fourth, the intensities are highly variable, more so in the X-ray than in the ultraviolet. Fifth, the ultraviolet spectral shape is only slightly variable, while the X-ray spectral shape is more strongly variable. Sixth, the connection between changes in spectral shape and intensity is not clear but in most cases, the observed X-ray variability is adequately explained by invoking changes in the relative strengths of two components. Dissert. Abstr.

N85-14768# Royal Greenwich Observatory, Herstmonceux (England).
CATALOGUE OF OBSERVATIONS OF TOTAL OCCULTATIONS OF STARS BY THE MOON FOR THE YEARS 1972 TO 1980 AND OF GRAZING OCCULTATIONS FOR THE YEARS 1963 TO 1980
G. M. Appleby, L. V. Morrison, and M. T. White 1984 12 p refs Document includes a Microfiche supplement
(Bull-192; ISSN-0308-5074) Avail: NTIS HC A02/MF A01; Royal Greenwich Observatory, Herstmonceux, UK £10

Collected times of 71,922 total occultations of stars by the Moon; positions of 3212 telescopes; names of 1703 observers, and collected times of 17,196 grazing occultations are presented. Author (ESA)

N85-14003# Cambridge Univ. (England).
THE UK AND NETHERLANDS MILLIMETRE-WAVE TELESCOPE
R. E. Hills *In* ESA Workshop on Mech. Technol. for Antennas Sep. 1984 p 29-30 Sponsored by UK Science and Engineering Research Council (For primary document see N85-13999 05-32)
Avail: NTIS HC A09/MF A01

N85-14740# Academy of Sciences, Potsdam (East Germany). Zentralinst. fuer Astrophysik.
A SEARCH FOR POSSIBLE MEMBERS OF OPEN CLUSTERS AMONG KNOWN Ap STARS
E. Zelwanowa and M. Popova (Bulgarian Academy of Sciences, Sofia) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 66-68 (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14741# Budapest Science Univ. (Hungary). Dept. of Astronomy.
THE PRESENT STATE OF THE INTERNATIONAL STAR CLUSTER PHOTOMETRY PROGRAMME
G. Szecsenyi-Nagy *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 69-79 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14742# Lund Observatory (Sweden).
THE LUND CATALOGUE OF OPEN CLUSTER PARAMETERS
Goesta Lynga *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 80-88 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14747# Main Astronomical Observatory, Pulkovo (USSR).
INVESTIGATION OF CENTRAL PARTS OF GLOBULAR CLUSTERS, PERFORMED IN PULKOVO
Z. I. Kadla and A. N. Gerashchenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 119-140 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14748# Sternberg Astronomical Inst., Moscow (USSR).
BRIGHTNESS DISTRIBUTION IN GLOBULAR CLUSTERS DERIVED BY THE NARROW-SLIT SCANNING METHOD
A. V. Mironov and E. V. Naumova (Leningrad State Univ.) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 141-144 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14756# Budapest Science Univ. (Hungary). Dept. of Astronomy.
ON THE MOST PROBABLE NUMBER OF FLARE STARS IN THE PLEIADES FIELD
G. Szecsenyi-Nagy *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 218-231 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14760# Academy of Sciences (USSR), Moscow. Astronomical Council.
THE INFLUENCE OF STELLAR LUMINOSITY AND TEMPERATURE CALIBRATION ON THE DETERMINATION OF THE INITIAL MASS FUNCTION
V. I. Myakutin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 242-252 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14761# Main Astronomical Observatory, Kiev (USSR).
ON THE CONTENT OF NITROGEN IN ATMOSPHERES OF LATE GIANTS DERIVED FROM MOLECULAR BANDS ON NH IN THE UV SPECTRAL RANGE
A. Shavrina *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxyy 1983 p 253-254 refs In RUSSIAN (For primary document see N85-14732 05-90)
Avail: NTIS HC A14/MF A01

N85-14762# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
THE VELOCITY-AGE RELATION FOR B AND A STARS Abstract Only
J. Palous and A. E. Piskunov (Academy of Sciences, Moscow) *In its* Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 256-257 In ENGLISH and RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14763# Volgograd State Univ. (USSR).
STABILITY OF STELLAR DISK AND RATIO OF HALO TO DISK MASSES IN THE GALAXY
A. G. Morozov *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 258-261 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14764# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
EXCITATION OF SPIRAL PATTERNS IN RESPONSIBLE DENSITY WAVE THEORY
K. O. Thielheim *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 262-279 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-14769 California Inst. of Tech., Pasadena.
TOPICS IN BLACK-HOLE PHYSICS: GEOMETRIC CONSTRAINTS ON NONCOLLAPSING, GRAVITATING SYSTEMS, AND TIDAL DISTORTIONS OF A SCHWARZSCHILD BLACK HOLE
Ian H. Redmount 1984 132 p
Avail: Univ. Microfilms Order No. DA8414990

The general-relativistic theory of black holes is discussed with emphasis upon black-hole formation and the mechanical behavior of a black hole. The problem of geometric constraints determining gravitational collapse or non-collapse is approached through the initial-value formalism of general relativity. Initial-value data representing noncollapsing, nonsingular, axisymmetric matter systems are constructed and the constraints imposed on this construction by the initial-value equation derived from the Einstein field equations are examined. The initial-value equation is found to impose restrictions on the choice of the boundary surface for such a system. Two such constraints are obtained which are appropriate to spherical and toroidal interior-region topologies. The tidal distortion of a Schwarzschild black hole is examined by bodies (moons) suspended above the horizon on ropes. A solution of the Einstein field equations is constructed describing this configuration, using the Weyl formalis for axisymmetric, static, vacuum geometries. The intrinsic geometry of the tidally deformed black-hole horizon is obtained from this solution. Dissert. Abstr.

N85-14770 Harvard Univ., Cambridge, Mass.
CONTINUUM DISTRIBUTIONS OF ACTIVE GALACTIC NUCLEI Ph.D. Thesis
Irene Cruz-Gonzalez 1984 367 p
Avail: Univ. Microfilms Order No. DA8419443

The broad band spectral energy distributions of a large sample of active galactic nuclei are described. The sample consists of 25 BL Lac objects, 92 quasars and 128 Seyfert galaxies. Observational data was compiled at radio, infrared, optical and X-ray frequencies. The data set was complemented with infrared observations. Spectral indices, colors, and luminosities were derived and compared for each class of AGN. Different methods of analysis were applied to the broad band continuum data in order to understand the contribution to the observed continua of the various components (non-thermal source, galaxy starlight and dust).
Dissert. Abstr.

N85-14771 California Inst. of Tech., Pasadena.
PHYSICAL CONDITIONS IN LOW-LUMINOSITY ACTIVE GALACTIC NUCLEI Ph.D. Thesis
Filippenko Alexei Vladimir 1984 313 p
Avail: Univ. Microfilms Order No. DA8420807

Physical conditions in the nuclei of emission-line galaxies are investigated by analyzing their continua and optical emission lines. The strength and shape of the nonstellar continuum is derived from nine Seyfert galaxies. As in QSOs, it is described by a power law with slope approximately -1.1, and in the most luminous objects it flattens at blue and UV wavelengths. Even at minimum brightness it has no short-wavelength cutoff near 1 micron, eliminating the possibility that the near-infrared flux is dominated by thermal emission from hot dust grains. A detailed analysis at optical and X-ray energies demonstrates that gas in the nucleus of NGC7213 is photoionized by nonstellar radiation, even though it also exhibits the spectral characteristics of galaxies thought to be heated by shocks. After careful removal of the strong stellar component, it is shown how these shock features are actually more consistent with photoionization. The key is a large range of densities approximately 1 x 10(3) power to 1 x 10(7)/cu cm in the narrow-line clouds, and a fairly low ionization parameter. Dissert. Abstr.

N85-14772 California Univ., Irvine.
THE PERIOD OF ORBIT AS A TEST OF THE GENERAL THEORY OF RELATIVITY Ph.D. Thesis
Howard Glenn Preston 1984 255 p
Avail: Univ. Microfilms Order No. DA8420270

The formalism of the General Relativity Hamilton-Jacobi equation suggests four types of corrections due to General Relativity that might be the basis of a test of the predictions of General Relativity. Tests were conducted on only three of these corrections. The fourth correction which is to period of orbit is derived for the circular case using the geodesic equation. Using the Hamilton-Jacobi formalism and phase integral canonical transforms, the General Relativity form of Kepler's third law is

derived and is valid for arbitrary eccentricities. The time-delay experiment numerically integrated the motion of six planets and least square adjusted the orbital constants over a period of 80 years. This experiment did not detect the period or orbit because of the particular formalism that is used in the least square adjustment procedure. A modification of the least square data reduction program is made and programmed. The modified program, as designed, will accurately measure the period of orbit. Dissert. Abstr.

N85-14773 Ohio State Univ., Columbus.
THE CORRELATION BETWEEN EXCITATION PARAMETER AND NEBULAR LUMINOSITY FOR GALACTIC HII REGIONS WITH APPLICATION TO REGIONS OF STAR FORMATION IN M83 Ph.D. Thesis
Kenneth Scott Rumstay 1984 170 p
Avail: Univ. Microfilms Order No. DA8419006

To examine whether a statistically viable relation between nebular luminosity and excitation parameter (U) exists, a sample of evolved galactic H II regions was selected for which the exciting stars have been identified. A 10 cm f/8 telescope with a speciality constructed photometer was used to obtain integrated H alpha and H beta fluxes for thirteen Sharpless H II regions. Combining these with previously measured fluxes yielded H alpha fluxes for 27 nebulae, and H beta fluxes for all but three of these. The results indicate that the uncertainty in the value of U calculated from radio continuum flux densities is about 20%. Using H alpha and H beta fluxes and a standard reddening law to correct for interstellar extinction results in an uncertainty of about 25 to 30% in U. In addition these random uncertainties, U is systematically underestimated by 20 to 25%. These results are applied to the spiral galaxy M83. The giant regions more concentrated in a two-armed spiral pattern than the nongiant regions, and have a more sharply peaked radial distribution function. Dissert. Abstr.

N85-14774*# Lunar and Planetary Inst., Houston, Tex.
[DYNAMIC CRYSTALLIZATION OF SILICATE MELTS]
W. John Russell 10 Aug. 1984 34 p refs
(Contract NASw-3389)
(NASA-CR-174103; NAS 1.26:174103) Avail: NTIS HC A03/MF A01 CSCL 03B

Two types of furnaces with differing temperature range capabilities were used to provide variations in melt temperatures and cooling rates in a study of the effects of heterogeneous nucleation on crystallization. Materials of chondrule composition were used to further understanding of how the disequilibrium features displayed by minerals in rocks are formed. Results show that the textures of natural chondrules were duplicated. It is concluded that the melt history is dominant over cooling rate and composition in controlling texture. The importance of nuclei, which are most readily derived from preexisting crystalline material, support an origin for natural chondrules based on remelting of crystalline material. This would be compatible with a simple, uniform chondrule forming process having only slight variations in thermal histories resulting in the wide range of textures. A.R.H.

N85-14775# Los Alamos Scientific Lab., N. Mex.
IRON CORE COLLAPSE MODELS OF TYPE 2 SUPERNOVAE
Richard L. Bowers 1984 20 p refs Presented at the Numerical Astrophys. Conf., Urbana, Ill., 21 Oct. 1982
(Contract W-7405-eng-36)
(DE84-013909; LA-UR-84-1937; CONF-8210111-4) Avail: NTIS HC A02/MF A01

Results of numerical, one-dimensional core collapse calculations for 10M sub solar mass, 15M sub solar mass, and 20M sub solar mass population I stars are reviewed. The physics model is discussed, including improvements in the nuclear equations of state, and nucler binding energies. None of the models produces prompt explosions as a direct result of core collapse and bounce. DOE

N85-14776# State Univ. of New York, Stony Brook.
RESEARCH IN NUCLEAR ASTROPHYSICS: STELLAR COLLAPSE AND SUPERNOVAE Progress Report
A. Burrows, J. M. Lattimer, and A. Yahil 1984 71 p refs
(Contract DE-AC02-80ER-10719)
(DE84-015559; DOE/ER-10719/T2) Avail: NTIS HC A04/MF A01

The interaction between nuclear theory and some outstanding problems in astrophysics is examined. Stellar collapse, supernovae and neutron star formation are emphasized. The parallel development of the equation of state of hot, dense matter and a novel type of hydrodynamical code are examined. The LLPR compressible liquid drop model forms the basis for the former, and it is proposed to further refine it by including curvature corrections to the surface energy and by considering other nuclear force parameters which are in better agreement with experimentally determined quantities. The development of the equation of state can be used to analyze intermediate energy heavy ion collisions, which may illuminate the nucleon-nucleon force. The hydrodynamical code includes detailed neutrino transport and a fast approximation to the complete LLPR equation of state, which is necessary for numerical use. We propose to model not only the stellar collapse leading up to a supernova, but also the quasistatic deleptonization and cooling stages of the nascent neutron star. The role of neutrinos in stellar collapse and neutron star formation on the detectability and signatures of which neutrinos are the only direct method of obsevationally checking supernova theory are studied. Complementary studies include modelling both mass accretion in the nuclei of galaxies (which is probably responsible for the quasar phenomenon) and investigations of galaxy clustering and the large scale structure of the universe. DOE

N85-14733# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
STRUCTURAL PROPERTIES OF OPEN STAR CLUSTERS AND THEIR RELATION TO THE GALAXY
J. Ruprecht *In its* Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evaluation of the Galaxy 1983 p 2-12 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14734# Lund Observatory (Sweden).
OPEN STAR CLUSTERS AND THE EVOLUTION OF THE GALACTIC DISK
Goesta Lynga *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 13-27 (see also p. 292) refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14735# Urals A. M. Gorky State Univ., Sverdlovsk (USSR). Dept. of Astronomy and Geodesy.
ON THE SCALE OF DISTANCES OF THE GALAXY
K. A. Barkhatova and O. P. Pylskaya *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 14-27 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14736# Lausanne Univ. (Switzerland). Inst. d'Astronomie.
AGE GROUPS AND COMPOSITE DIAGRAMS FOR YOUNG OPEN CLUSTERS
J.-C. Mermilliod *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 28-36 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14737# Konkoly Observatory, Budapest (Hungary).
THE GALACTIC DISTRIBUTION OF OPEN CLUSTERS OF DIFFERENT AGES AND THE ANGULAR VELOCITY OF THE SPIRAL STRUCTURE
B. A. Balazs and Goesta Lynga (Lund Observatory) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc.

and their Relation to the Evolution of the Galaxy 1983 p 37-48 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14738# Sternwarte der Deutschen Akademie der Wissenschaften, Sonneberg (East Germany). Zentralinst. fuer Astrophysik.
THE BEHAVIOUR OF BRIGHTER BINARIES AND YELLOW GIANTS IN OPEN CLUSTERS
W. Goetz *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 49-59 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14739# Academy of Sciences of the Ukrainian SSR, Kiev (USSR).
ON COLLECTIVE EFFECTS IN THE ROTATION OF STARS IN CLUSTERS AND ASSOCIATIONS
B. E. Zhilyaev and S. V. Marchenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 60-65 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14743# Academy of Sciences (USSR), Moscow. Astronomical Council.
COLLECTIVE PROCESSES AND FORMATION OF STAR CLUSTERS
V. L. Polyachenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 89-102 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14744# Polish Academy of Sciences, Warsaw. Astronomical Center.
BINARIES AND EVOLUTION OF GLOBULAR CLUSTERS
J. S. Stodolkiewicz *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 103-114 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14745# Ceskoslovenska Akademie Ved, Prague.
EVOLUTION OF GLOBULAR CLUSTERS Abstract Only
In its Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 115-116 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14746# Sternberg Astronomical Inst., Moscow (USSR).
EVOLUTION OF GLOBULAR CLUSTERS Abstract Only
V. G. Surdin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 117-118 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14749# Observatorium Hoher List, Bonn (West Germany).
LESSONS FROM THE GLOBULAR CLUSTER NGC 5466
P. Brosche, M. Geffert, and S. Ninkovic (Astronomska Opservatorija, Belgrade) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 145-155 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14750# Sternberg Astronomical Inst., Moscow (USSR).
GALACTIC ORBITS OF GLOBULAR CLUSTERS
A. S. Rastorguev and V. G. Surdin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 156-160 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14751# Sternberg Astronomical Inst., Moscow (USSR).
THE FATE OF GLOBULAR CLUSTERS
V. G. Surdin *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 161-166 refs In RUSSIAN; ENGLISH summary (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14752# Max-Planck-Inst. fuer Astrophysik, Munich (West Germany).
THE DYNAMICAL EVOLUTION OF THE ENVIRONMENT OF AN OB ASSOCIATION
Guillermo Tenorio-Tagle *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 168-187 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14753# Main Astronomical Observatory, Kiev (USSR).
THE DISTRIBUTION OF DUST IN THE REGION OF THE ROSETTE NEBULA AND MON OB2 ASSOCIATION
N. G. Guseva *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 188-199 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14754# Byurakan Observatory (USSR).
NON-STABLE MOTIONS AND INSTABILITY IN STELLAR ASSOCIATIONS
L. V. Mirzoyan *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 200-211 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14755# Main Astronomical Observatory, Kiev (USSR).
PROPER MOTIONS AND KINEMATICAL PROPERTIES OF ORION TRAPEZIUM TYPE STELLAR SYSTEMS
A. I. Yatsenko *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 212-217 refs In RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14757# Karlova Univ., Prague (Czechoslovakia). Dept. of Astronomy and Astrophysics.
HYADES MOVING GROUP
J. Bubenicek and J. Palous (Astronomical Inst.) *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 232-239 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14758# Ceskoslovenska Akademie Ved, Ondrejov.
THE EVOLUTION OF A SPARSE STELLAR SYSTEM Abstract Only
P. Hadrava *In its* Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 248 In ENGLISH and RUSSIAN (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14759# Karlova Univ., Prague (Czechoslovakia). Dept. of Astronomy and Astrophysics.
THE FRAGMENTATION OF MOLECULAR CLOUDS AND THE IMF Abstract Only
V. Vanysek *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 241 In ENGLISH and RUSSIAN (For primary

document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14765# Stockholm School of Economics (Sweden).
LOCAL GALACTIC KINEMATICS
P. O. Lindblad, T. Westin, N. Zentelis, and K. Loden *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1984 p 280-286 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

N85-14766# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
KINEMATICS OF B AND A STARS
J. Palous *In* Ceskoslovenska Akademie Ved Fifth Conf. on Star Clusters and Assoc. and their Relation to the Evolution of the Galaxy 1983 p 287-291 refs (For primary document see N85-14732 05-88)
Avail: NTIS HC A14/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-14777*# California Inst. of Tech., Pasadena. Seismological Lab.
SHOCK-INDUCED CO2 LOSS FROM CaCO3: IMPLICATIONS FOR EARLY PLANETARY ATMOSPHERES
Manfred A. Lange and Thomas J. Ahrens 18 Dec. 1984 27 p refs
(Grant NGL-05-002-105)
(NASA-CR-174197; NAS 1.26:174197; Contrib-4166) Avail: NTIS HC A03/MF A01 CSCL 03B

Recovered samples from shock recovery experiments on single crystal calcite were subjected to thermogravimetric analysis to determine the amount of post-shock CO2, the decarbonization interval and the activation energy, for the removal of remaining CO2 in shock-loaded calcite. Comparison of post-shock CO2 with that initially present determines shock-induced CO2 loss as a function of shock pressure. Incipient to complete CO2 loss occurs over a pressure range of approximately 10 to approximately 70 GPa. Optical and scanning electron microscopy reveal structural changes, which are related to the shock-loading. The occurrence of dark, diffuse areas, which can be resolved as highly vesicular areas as observed with a scanning electron microscope are interpreted as representing quenched partial melts, into which shock-released CO2 was injected. The experimental results are used to constrain models of shock-produced, primary CO2 atmospheres on the accreting terrestrial planets. A.R.H.

N85-14778*# Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.
STUDIES OF RADIATIVE TRANSFER IN PLANETARY ATMOSPHERES Semiannual Status Report, 1 Jun. - 30 Nov. 1984
William M. Irvine and F. Peter Schloerb 30 Nov. 1984 5 p
(Grant NGL-22-010-023)
(NASA-CR-174194; NAS 1.26:174194; SASR-35) Avail: NTIS HC A02/MF A01 CSCL 03B

Progress is reported in modeling cometary emission in the 18-cm OH transition with specific application and predictions for Comet Halley. Radiative transfer is also being studied in rough and porous media. The kinematics of the cold, dark interstellar cloud Li34N were examined, and CO monitoring of Venus and Mars continues. Analysis of 3.4 mm maps of the lunar surface shows thermal anomalies associated with such surface features as the Crater Copernicus, Mare Imbrium, Mare Nubium, Mare Serenitatis, and Mare Tranquillatis. A.R.H.

N85-14779*# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science.
LOWER ATMOSPHERIC COMPOSITION OF JUPITER FROM VOYAGER INFRARED MEASUREMENTS Final Technical Report
Mian M. Abbas 1984 3 p
(Grant NAG5-208)
(NASA-CR-174196; NAS 1.26:174196) Avail: NTIS HC A02/MF A01 CSCL 03B

The observed spectrum of Jovian atmosphere exhibits spectral features of H2, CH4, C2H6, NH3, H2O, GeH4 and CH3D. Analytical programs were developed for radiative transfer calculations and for retrieval of lower atmospheric composition of Jupiter from the observed infrared spectrum. The program models developed are based line by line transmittance calculations with appropriate convolution of the instrument function. The constituent inversion programs were evaluated for accuracy by analyzing synthetic data for retrievals of NH3 profiles. The inversion programs were employed for retrieval of NH3 profiles from the Voyager infared data with results generally in agreement with the accepted values. A.R.H.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-14780 Harvard Univ., Cambridge, Mass.
MAGNETIC HELICITY IN THE SOLAR CORONA Ph.D. Thesis
Mitchell Anthony Berger 1984 139 p
Avail: Univ. Microfilms Order No. DA8419438

The relation of magnetic helicity to the structure and evolution of magnetic fields is discussed. Helicity measures the topological complexity of field lines: if a configuration is divided into a collection of flux tubes, then helicity arises from the linkage and knotting of the tubes, as well as from internal field line structure such as twist and kinking. If helicity is integrated over a volume not bounded by a magnetic surface (for example, the solar atmosphere), then the helicity integral cannot be related to field line linkage structure and will not be gauge-invariant. However, a well-defined relative measure of helicity for arbitrary volumes is shown to exist. The potential field, which is uniquely determined by boundary conditions, provides a universal reference field for this relative helicity measure. The time derivative of the relative helicity of a volume measures helicity flow across the boundaries of the volume, as well as internal dissipation. Helicity flow from the interior of the Sun into the corona can be determined by observing the motion of photospheric magnetic flux. Dissert. Abstr.

N85-14781 California Univ., San Diego.
THE RADIATIVE HYDRODYNAMICS OF FLARE LOOPS HEATED BY IMPULSIVE BURSTS OF ENERGETIC ELECTRONS Ph.D. Thesis
George Hewitt Fisher 1984 152 p
Avail: Univ. Microfilms Order No. DA8418283

The hydrodynamic and radiative responses of a preflare solar loop atmosphere to a short burst of energy in the form of energetic nonthermal electrons were modeled. Energy fluxes in the calculations range over values are suggested by observations. The major conclusions are: (1) There is an energy flux threshold for explosive evaporation. Explosive evaporation occurs when the upper chromosphere is unable to radiate the flare energy deposited there, and is therefore heated rapidly to coronal temperatures; (2) The expansion velocity of explosively evaporated plasma cannot exceed about 2.35 c sub s where c sub s is the sound speed in the evaporated material; (3) A simple analytic gasbag model for the temporal variation of velocity in the explosively evaporated plasma successfully reproduces the numerical results;

and (4) The lower transition region, in both gentle and explosive evaporation, quickly reaches a quasisteady balance between conduction and radiation. Dissert. Abstr.

N85-14782 Stanford Univ., Calif.
STRUCTURE AND EVOLUTION OF THE LARGE SCALE SOLAR AND HELIOSPHERIC MAGNETIC FIELDS Ph.D. Thesis
Jon Todd Hoeksema 1984 233 p
Avail: Univ. Microfilms Order No. DA8420551

The structure and evolution of the large scale photospheric and coronal magnetic fields in the interval 1976 to 1983 were studied using observations from the Stanford Solar Observatory and a potential field model. The model predicts the location of the current sheet. Near solar equator having two extension north and south of the equator. Soon after minimum the latitudinal extent began to increase. The sheet reached to at least 50 degrees from 1978 through 1983. During most of the solar cycle the quadrupole and occasionally octupole moments of the field are important, especially for the structure in the ecliptic. The complex field configuration near maximum does not correspond to a dipole rotating from north to south as the polar fields change as has been previously suggested. The large latitudinal extent of the current sheet over much of the cycle affects the propagation of cosmic rays. Dissert. Abstr.

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-14783*# California Univ., Berkeley.
ISOTOPIC COMPOSITION OF PRIMARY COSMIC RAYS H-Fe FOR ISEE-C Final Report
Harry H. Heckman [1984] 19 p refs
(Contract NAS5-20995)
(NASA-CR-175266; NAS 1.26:175266) Avail: NTIS HC A02/MF A01 CSCL 03C

The high energy cosmic ray instrument built for the International Sun-Earth Explorer is described. Some aspects of that system are critically renewed so that the experience gained in the design, construction and operation of this experiment can serve as a guide in designing future cosmic ray particle identification systems. A.R.H.

N85-14784*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE NATURE OF THE BARYON ASYMMETRY
F. W. Stecker Aug. 1984 15 p refs Presented at the Intern. Symp. on Phase Transitions in the Early Universe, Bielefeld, West Germany, Jun. 1984 Submitted for publication
(NASA-TM-86156; NAS 1.15:86156) Avail: NTIS HC A02/MF A01 CSCL 03B

Whether the baryon asymmetry in the universe is a locally varying or universally fixed number is examined with focus on the existence of a possible matter antimatter domain structure in the universe arising from a GUT with spontaneous CP symmetry breaking. Theoretical considerations and observational data and astrophysical tests relating to this fundamental question are reviewed. A.R.H.

N85-14785# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
NEW MEASUREMENTS OF THE SPECTRUM OF THE COSMIC MICROWAVE BACKGROUND
J. B. Peterson, P. L. Richards, J. L. Bonomo, and T. Timusk (McMaster Univ.) Jun. 1984 20 p refs Presented at the Conf. on Inner Space/Outer Space, Batavia, Ill., 2-5 May 1984
(Contract DE-AC03-76SF-00098)
(DE84-016055; LBL-18073; CONF-8405155-3) Avail: NTIS HC A02/MF A01

Accurate measurements of the spectrum of the cosmic microwave background (CMB) can provide useful tests of cosmological theories. The data set existing in 1982 is summarized. To first approximation the CMB is characterized by a single temperature and thus has a blackbody spectrum over the frequency range from 0.02 to 24/cm. The error limits given for these experiments are dominated by systematic errors and are often very subjective. Consequently, it is not clear how to analyze the data set in a valid way. The general impression, however, is of a scatter in the high frequency data that is somewhat larger than would be expected from the given error limits. An apparatus to measure the spectrum of the CMB in the frequency range from 3 to 10/cm designed is described. DOE

99 GENERAL

No abstracts in this category.

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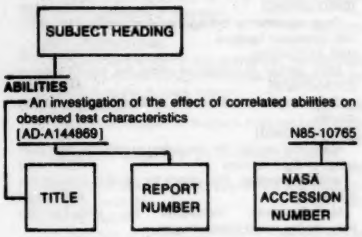

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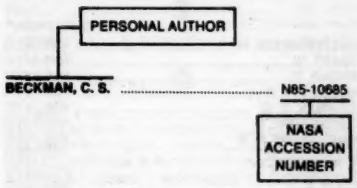

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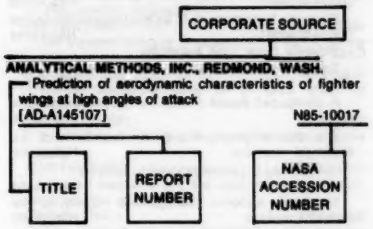

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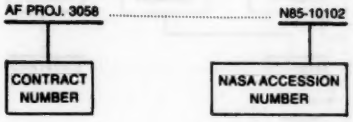

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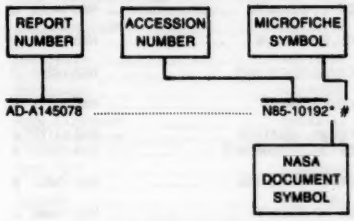

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